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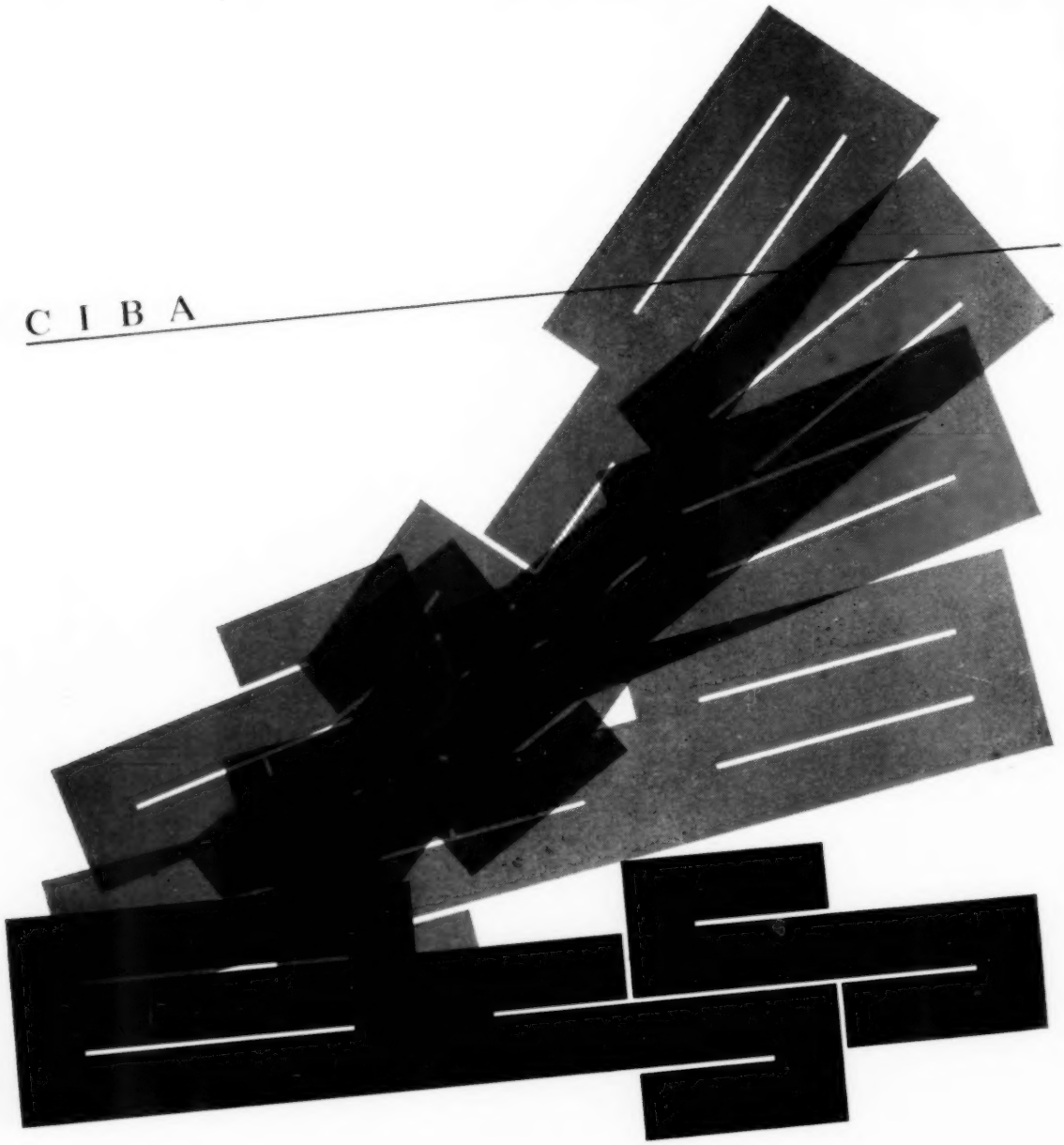

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The Physical Principles of the Milking Machine

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THE weight of evidence over the years that machine milking is in some way responsible for the majority of aspecific mastitis outbreaks in our dairy herds is overwhelming.

In 1949, when a large-scale trial was conducted in the county of Surrey for the eradication of *Streptococcus agalactiae*, a number of farmers reported that, although this organism was removed from their herds, cases of mastitis still occurred (Wilson, 1953). Six hundred herds were included in the experiment, and of these 280 were hand-milked; yet in not one such herd was mastitis a problem. All the herds with a mastitis problem were machine milked and it seemed logical to study both the machine and the methods of milking employed.

A controlled experiment made in one herd showed that a particular design of teat cup liner was associated with mastitis, 32 cases of mastitis occurring in the test group of cows as compared with 2 in the control group (Wilson, 1952). This observation was confirmed by N.I.R.D. workers (Dodd *et al.*, 1957), but subsequent experience has shown that herd outbreaks of mastitis often occur with other designs of liner (Maffey, 1959). Experience in the field has not provided proof that other features of machine milking *per se* promote mastitis, with the exception of a fluctuating vacuum level (Wilson, 1958).

This association of mastitis with machine milking, and the lack of evidence incriminating any particular machine, has led to the opinion that it is the operator of the machine rather than the machine itself who is responsible. Meanwhile mastitis continues, and the M.M.B. figures for 1956 show that, on the average, every cow in the country experiences mastitis 3 to 4 times annually.

A satisfactory method of instruction of cowmen in milking method appears to be the most pressing requirement to-day. Instruction in milking method through a knowledge of the physical principles of the milking machine is usually attended by a high degree of success. Resolution of outbreaks of mastitis occurs in 80 per cent. of the herds (Maffey, 1959).

The Milking Machine

At first sight the physical principles underlying milking machine operation may appear complex, but a knowledge of the basic principles supplemented by personal observation when opportunity arises, will lead finally to complete understanding.

Our interest is the way in which the action of the machine affects the cow at the level of the teat cup, but to appreciate this consideration has to be given to machine factors which lead to an effect at this level. The machine as an entire unit may be described broadly as a pipe system through which there is a flow of the fluids, air and milk, and which, for convenience, may be divided into the vacuum or air flow system, and the milk flow system.

Although one fluid is a gas and the other a liquid, their motion or flow characteristics are, in practice, similar; the study of the flow of water in pipes has led to an understanding of air flow. The flow of fluids is retarded by the frictional resistance of the walls of the pipe so that flow should be in pipes of adequate diameter, free from obstructions and large numbers of bends.

In practice, flow is rarely smooth in the machine, but is turbulent in character due to the high flow rate and pipe resistance. The flow of air in the various components is of the utmost importance in determining the pressure levels for correct operation of the machine.

The milking machine is usually operated at 13 to 15 inches of mercury vacuum (note: *not* pounds), the static pressure below that of the atmosphere of 30 inches Hg. or 15 lb. per sq. inch. Therefore, 30 inches Hg. is equivalent to 15 lb. per sq. inch and 2 inches Hg. equivalent to 1 lb. per sq. inch approximately.

I. The Vacuum System

The Vacuum system comprises the pump, vacuum tank or sanitary trap, vacuum controller or relief valve, the vacuum lines and the pulsation system.

(a) *Vacuum Pump*

The pump is usually of the rotary type as in Fig.

1, and the characteristic it produces in terms of air flow at increasing vacuum levels is shown in Fig. 2. It is seen that as the operational vacuum rises, less air is passed by the pump, the drop being roughly proportional to the rise in vacuum level. The pump capacity in this case is 22 cu. ft. per min. of free air at 0 inches Hg. *vacuum* and 7.5 cu. ft. per min. of free air at 15 inches Hg. vacuum ("free air" = volume of air at atmospheric pressure).

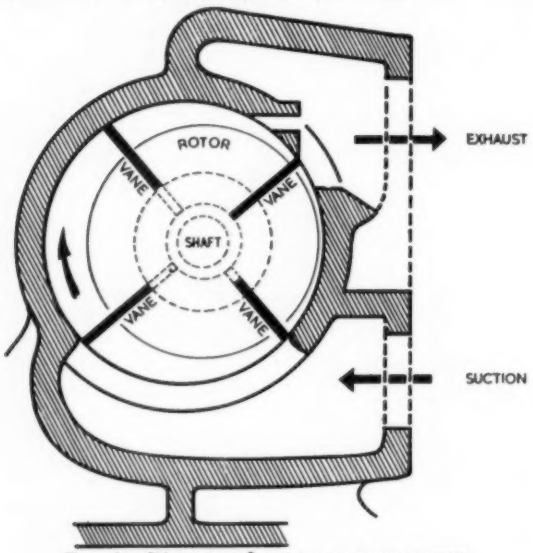

FIG. 1.—Diagram of rotary vacuum pump.

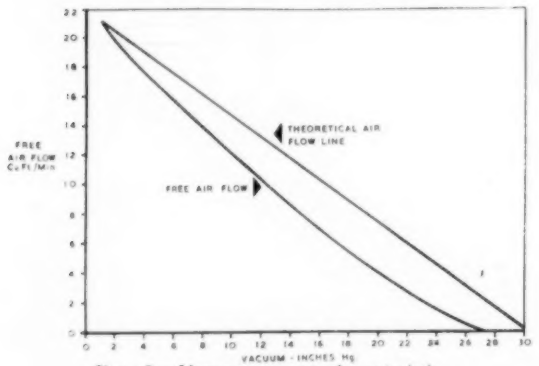

FIG. 2.—Vacuum pump characteristic.

In construction, the pump consists of a cylinder and a centrally placed revolving shaft with vanes mounted on it in a rotor. A motor, usually electrical, revolves the shaft by direct drive or by a pulley and belt system so that the vanes spin in the cylinder. As the vanes spin and are held against the cylinder wall by centrifugal force, the air is drawn in at the inlet port and forced out through the exhaust port. To prevent "slipping back" of air there is an oil seal between the vanes and cylinder wall and between the shaft-rotor and cylinder ends. Some pumps have carbon vanes and are oil-less.

Make	Type	Number of Units	
	Pump	Bucket	Recorder
Alfa laval	9	1–2	
	20	3–6	1–3
	100	6–10	4–6
	200	10–20	7–10
Fullwood ...	C 10	2	
	C 14	4	
	C 17	6	4
	FC 25	8	6
	C 36	16	
Gascoigne ...	J	2	2
	A	3–4	3
	B	4–6	4
	C	6–9	5–8
Manus	VPI 1	1–3	
	VPI 2	4–6	
	VPI 3	7–10	
Melotte	PR	3	
	PRB	3	
	PG	5	
	PGB	5	
	P 45	6	
	P 45S	6–12	
Simplex	Standard	4	
	Double Capacity	6	
Vaccar	750	2	
	1250	3–5	2
	1500	5+	3–5
	2000		5+

FIG. 3.—Machine manufacturers pump type recommendations

(b) *Vacuum Tank or Sanitary Trap*

This is, as the name implies, simply a metal tank or bucket situated immediately after the pump. Its volume has the effect of stabilising the air flow, and smoothing out the cyclic variations caused by the motion of the pump, and it acts as a small vacuum store. On most plants the volume of the vacuum tank is standardised to about 4 gallons. It is also termed the sanitary trap as it receives the fluid used to wash out the air line.

(c) *The Vacuum Controller or Relief Valve*

This unit has the important task of controlling the vacuum produced by the pump. The pump extracts more air from the system than is necessary to produce the proper vacuum and the controller stabilises this vacuum at a predetermined level by the readmission of air at atmospheric pressure. In principle it is a safety valve as used on steam engines, handling negative instead of positive pressure, but at much lower levels.

There are 2 main types, the dead weight and the spring loaded (Fig. 4). They open to admit atmospheric air into the vacuum pipe system when the level exceeds operational vacuum, to close again when this has been restored. The dead weight type is the more satisfactory, chiefly because the

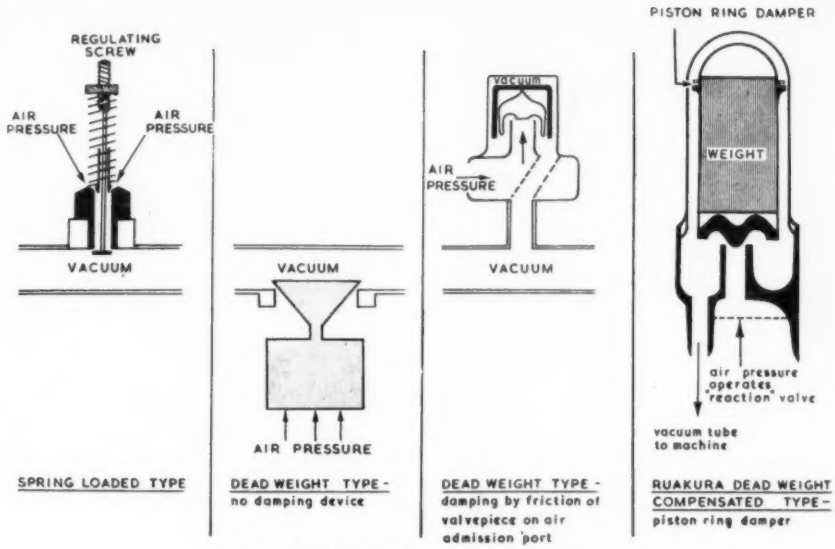

FIG. 4.—Types of vacuum controller.

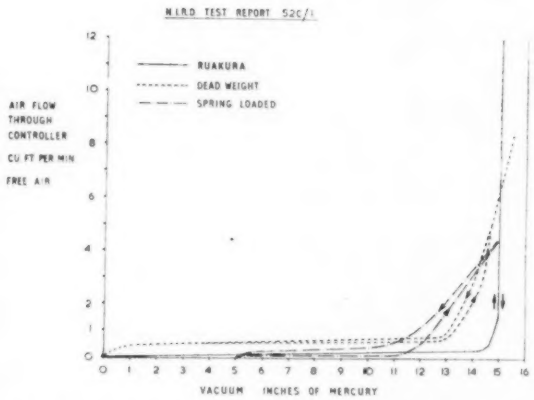

FIG. 5.—Air flow/vacuum characteristic of three vacuum controllers.

weight exerts a constant force on the valve whereas the force increases as a spring is compressed. The vacuum level may, therefore, have to rise above the operational value to compensate for the increased force of the spring. For this reason and the fact that frictional forces are greater with the spring type, dead weight controllers are usually fitted to machines. Their respective characteristics are shown in Fig. 5, the best being shown by the Ruakura dead weight compensated type (Whittlestone, 1950; N.I.R.D., 1952a).

Whittlestone considers that a good valve should open and close with perhaps only a $\frac{1}{4}$-inch Hg. variation in vacuum level and that some sort of damping device is necessary to prevent the valve "chattering" in an effort to keep up with rapid vacuum variations (Whittlestone, 1949).

(d) *Position of the Controller*

The siting of the controller affects the measure of control it can exert on the vacuum level of the machine. If sited at the beginning of the vacuum line after the sanitary trap, it is free from the cyclic effects of the pump and pulsator air intakes, can mediate between the higher level of vacuum at the pump and the units, and make the vacuum from the pump readily available by closing promptly.

To operate correctly a dead weight controller should be in a vertical position, free from vibration, the valve seating in good repair, clean and free from oil. It is usually above the vacuum line to avoid corrosion from solutions used to cleanse this line, but the pipe connexion should be of adequate bore, not less than the diameter of the valve, to allow rapid flow of the air it admits.

(e) *The Air or Vacuum Lines*

The vacuum line needs to be of adequate bore, usually not less than 1 inch in internal diameter, free from obstructions, not of excessive length and without a large number of bends. All these considerations are necessary to reduce resistance to air flow.

For instance a 90° *elbow* bend, which is, unfortunately, much used in the construction of pipe lines, has 45 times the resistance of an equivalent length of straight pipe line (Ower, 1949). The flow of air in the various components is of the utmost importance in determining the pressure levels for correct operation of the machine.

Where layout of the vacuum line is lengthy and tortuous, as in some bucket-plant installations, or where a particularly large plant in terms of number of units exists, the problem of maintaining an adequate vacuum can be improved by a system known as the "ring main." This consists of returning the end of the run of vacuum line back to the pump

so that a dual extraction of air is available and the resistance is that of the shortest path.

The distribution of vacuum to the units in bucket and in-churn plants is of a simple character by means of a rubber tube from the vacuum line. In the straight releaser and autorecorder types (Figs. 6 and 7), however, there is a dual supply, one to the pulsators and in the case of the autorecorder to the measuring jars also, and a second to the releaser for transmission to the milk line. This arrangement isolates the milk line from the vacuum line, and the vacuum level in the milk line is dependent on conditions dictated by releaser action and milk flow, as will be seen when these types of machine are discussed later.

The pulsators are connected direct to the vacuum line in any type of machine by the pulse tubes, in the bucket plant in the manner of Fig. 1 of Wilson (1958) and in the case of a master pulsation system as in Fig. 8.

(f) *The Pulsation System*

Pulsator action and design. The pulsator is the device which, by the production of an intermittent vacuum, causes an alternate compression and release on the cow's teats through the medium of the rubber liner in the teat cup.

The basic principle of operation may perhaps best be demonstrated by the action of the slide type (Fig. 9). A slide moving to and fro over 2 ports

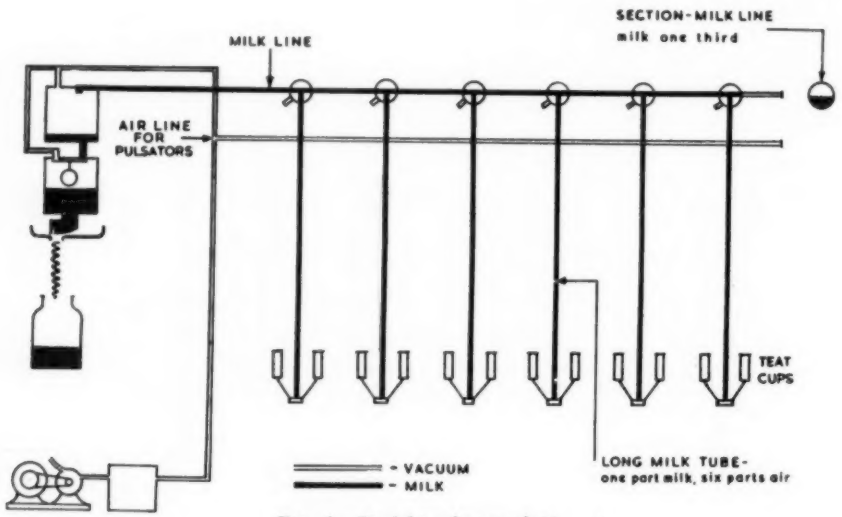

FIG. 6.—Straight releaser plant.

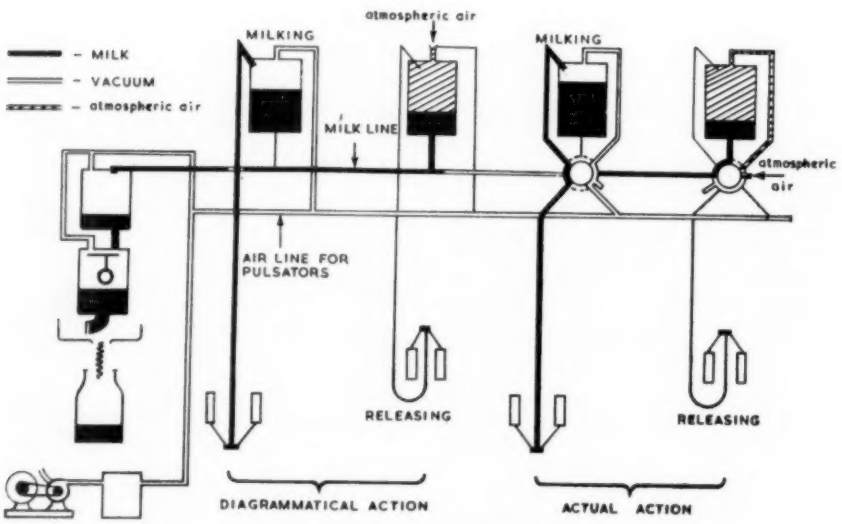

FIG. 7.—Auto-recorder plant.

in a valve face, alternately connects the port leading to the pulsation chamber of the teat cup with the vacuum line of the machine and with the atmospheric air. As continuous vacuum prevails inside the teat cup liner, the liner is straight when the pulsation chamber outside the liner is under vacuum (the pressures being the same on both sides), and collapsed when it receives atmospheric air: the milking and squeeze phases respectively in the pulsation cycle.

Pulsators may be classified generally according to their prime mover. Descriptions of design, with photographs of most types, have been made by Whittlestone (1949) and M.A.F.F. (1959 i), and design principles discussed by Phillips (1958).

(g) *Operation of the Vacuum System*

Vacuum is built up by the extraction of air by the pump which is capable of producing a negative pressure rising to about 29 inches Hg. *vacuum* compared with the absolute vacuum of approximately 30 inches Hg. vacuum.* But the controller opens to admit atmospheric air and thus maintains a lower operational level of negative pressure, smoothing out variations by continuous action during milking. Should the vacuum level fall below operational, the controller can close and this extra or reserve extraction power of the pump is then used to remove the additional air which has entered the machine and caused the vacuum level to fall.

In the normal way 90 per cent. of the atmospheric air which enters the machine system enters through the pulsators (when the pulsation chamber of the teat cups is exhausted)—the machine consumption of vacuum or air at negative pressure. Additional atmospheric air enters at liner mouthpieces when cows are stripped, when clusters are changed or fall from cows, etc., and this is extracted by the reserve vacuum or reserve air (at negative pressure) from the pump when the controller closes.

Sufficient vacuum reserve is important, as low vacuum reserve manifests itself by a fall in operational vacuum and vacuum fluctuations which cause slow milking and falling clusters. There is evidence (Wilson, 1958) that vacuum fluctuation may be to blame for some outbreaks of mastitis.

* An absolute vacuum is 0" Hyg. which in machine terminology is 30" Hg. vacuum.

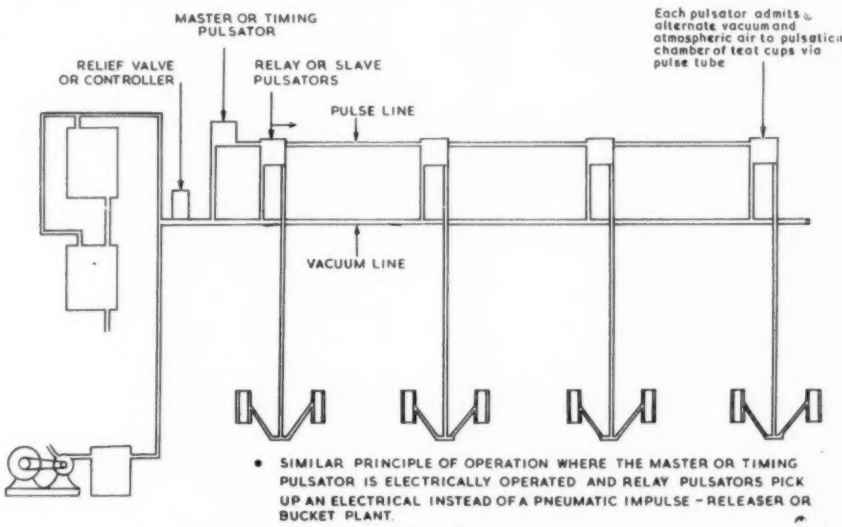
MASTER OR TIMING PULSATOR
RELIEF VALVE OR CONTROLLER
RELAY OR SLAVE PULSATORS
PULSE LINE
Each pulsator admits alternate vacuum and atmospheric air to pulsation chamber of teat cups via pulse tube
VACUUM LINE
* SIMILAR PRINCIPLE OF OPERATION WHERE THE MASTER OR TIMING PULSATOR IS ELECTRICALLY OPERATED AND RELAY PULSATORS PICK UP AN ELECTRICAL INSTEAD OF A PNEUMATIC IMPULSE - RELEASER OR BUCKET PLANT.

FIG. 8.—Master pulsation system.

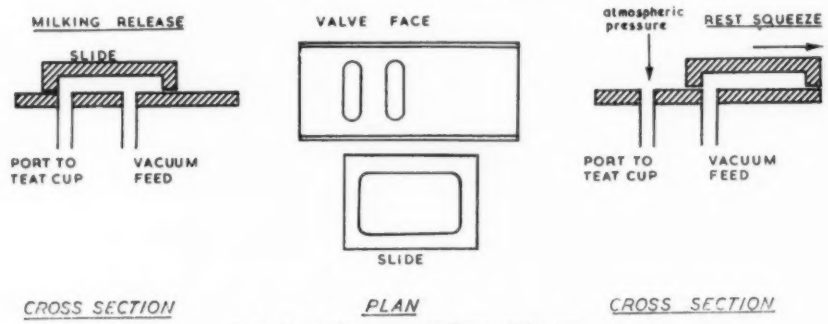

FIG. 9.—Pulsator operation: slide type.

But to assess the requisite vacuum reserve for a particular machine presents a physical problem that is linked with air flow from the point where air is entering the pipe system of the machine and flow to the pump which is extracting it. The principle involved is that, although there is always some vacuum fluctuation during the operation of a machine, it should be transitory and not felt by the cow at cluster level. This can be determined only by a vacuum recording at the cluster in conjunction with a measurement of air flow through the pump using a recording vacuum gauge and air flow meter (Phillips, 1952a). But for practical purposes, if when all milking units are working, air can be heard entering the machine *via* the controller, it can be assumed that the machine is operating with an adequate vacuum reserve. Fig. 3 lists different machine companies' pumps and the types they recommend for a given number of milking units. The Bourdon vacuum gauge on the vacuum line of the machine, *if working*, will also be a guide to operational conditions. More air must be exhausted from a machine if the operational vacuum is raised, or the pulsator rate is increased so that the vacuum reserve must be checked in these circumstances.

There is another consideration in maintaining a stable vacuum level for milking—the total volume of the machine. If this is increased, say by a larger vacuum tank, the "recovery time" of vacuum level to normal after an air leak is also increased. The total volume of a machine should, therefore, be as small as possible. A new situation arises if this volume takes the form of a bucket or similar vessel close to the cow, when a sort of local vacuum demand is created. The air gaining admission during the changing of clusters at one milking unit does not severely affect the rest of the system.

The operation of the pulsation system plays an important rôle in milking, secondary only to the teat cup liner itself for which it provides the actuating force. The manner in which this force is applied can be determined only by the plotting of the pressure changes in the pulsation chamber of the teat cup during the pulsation cycle. A typical pressure change curve or pulsation characteristic, made with a portable vacuum recording gauge, is shown in Fig. 10 demonstrating the rapidity of the changes and the pressure values over them. To interpret their effect on milking, the actual point when pressure cuts off milk flow by causing the liner to squeeze the teat has to be determined. Work in the engineering department of the N.I.R.D. (Dodd, 1959), using ciné X-ray methods (Ardran *et al.*, 1958), suggests that this occurs at about 12 inches Hg vacuum level in the pulsation chamber of the teat cup (Fig. 10).

The longer the time over which the curve is in the milking position, the faster will be the extraction rate of milk, so that a curve demonstrating a quick release and slow squeeze is desirable for fast milking.

Pulsation characteristic taken *at the teat cup* is, therefore, important in all assessments of pulsation, as the characteristic changes markedly from pulsator to teat cup consequent on the nature of air flow which is influenced by pulsator design, volume of the pulse system, and the diameter of the pulse line (Fig. 10).

Similar considerations apply in the design of commercial installations to ensure a desirable and even pulsation characteristic at each milking unit, to prevent disturbance to the cow.

II. The Milk Flow System

Milk flow commences at the teat cup, travels through the pipe system and terminates in the receiving vessel, the releaser being employed if discharge from the machine is automatic. Flow may be considered at these 3 levels.

(a) *Teat Cup Flow* (including teat cup action) (Fig. 12 radiographs)

Milk flow is initiated when the teat cups, which are under continuous vacuum, are placed on the cow's teats. Milk ejection by the cow causes intramammary pressure to rise initially to approximately 3 inches Hg. of *positive* pressure although this falls as milking proceeds (Tgetgel, 1926). The pressure

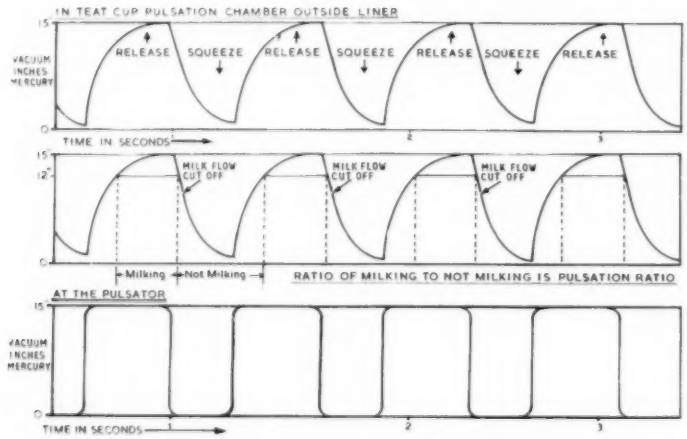

FIG. 10.—Pulsation characteristic: recording vacuum gauge.

differential across the teat—between the udder and the machine—opens the teat sphincter to withdraw the milk.

Later, with the fall in intramammary pressure, the teat is drawn into the liner until a point is reached when the mouthpiece of the liner cuts off milk flow by compressing the teat canal at the base of the teat—the stripping point—when it is necessary for hand pressure on the clawpiece to pull the liner mouthpieces off the bases of the teats to release the last of the milk.

In machine milking, therefore, we speak of the machine time and the stripping time which, together, constitute the overall milking time. In mastitis control work an idea of the duration of the machine time when machine factors such as vacuum level, pulsation ratio, etc., are varied, is useful. It provides an estimate of when we can expect the milk flow to be arrested by the onset of the stripping point with a particular type of machine. Only estimate is possible, as the individual cow is able to qualify the effect of machine factors by the diameter of the teat sphincter. This can be measured by the simple method of suspending the milking bucket on a spring balance and reading off the weight of milk at half-minute intervals (Foot, 1935), by an electrical system (Whittlestone, 1945), or by means of the Ruakura Milk Flow Indicator, interposed in the long milk tube and held in the hand.

Machine factors which increase the milk flow rate (both the average and peak flow), act either by increasing the pressure differential (in negative pressure) across the teat, or by increasing the time over which this differential pressure can operate in each milking phase of the pulsation cycle (the time of milking to squeezing of the teat—the pulsation ratio). An example of the former case is given by adjusting the vacuum from 15 to 20 inches Hg. at the vacuum controller when the peak flow rate of milk is increased by 20 per cent. (N.I.R.D., 1955); an example of the latter is provided by adjusting the pulsation ratio from 1 : 1 to 3 : 1 at the pulsator when the increase in peak flow rate is from 35 to 40 per cent. (N.I.R.D., 1956; Dodd, 1959a).

Vacuum level and pulsation ratio are changed by less obvious machine factors. Vacuum levels are in part dependent on the rapidity of milk and air flow in the pipe system; pulsation ratio is changed by the longitudinal tension of a liner and probably by an increase of the pulsation rate; the liner moves more rapidly into the milking phase when under tension and at high rates of pulsation.

The effect of these factors can be studied only by special techniques of cinematograph and cineradiograph (Ardran *et al.*, 1958). These workers have estimated that a liner tension increase from 5 to 25 lb. increased the peak flow milk rate by 20 per cent. (M.A.F.F., 1959 ii) and a pulsation rate varied from 20 up to 80 cycles per minute provides an increase of 22 per cent. in the peak flow rate (Clough *et al.*, 1953).

Secondly, in milking, the time taken for machine stripping has to be considered, and a number of machine factors, owing to the nature of the onset of the stripping point, due to "teat cup crawl" play their part. Thus it is found that teat cup liners with hard mouthpieces cause an earlier compression of the teat canal, leaving some 15 per cent. of the total milk yield in the quarter in the form of strippings, as against 5 per cent. by a soft mouthpiece (Dodd, 1957). The weight of the cluster plays its part in controlling the "crawl" of the cup, so that light cluster assemblies or those supported by back cords leave more milk as strippings (Dodd & Henriques, 1949; Maddever & Egdell, 1949). Lastly, high vacuum, although increasing milk flow, causes the earlier onset of the stripping point as machine vacuum overcomes intramammary pressure sooner to compress the teat. A compromise level of 18 inches Hg. (Dodd, 1957) has been estimated at which the machine milking time plus the stripping time (the overall time) is shortest.

Finally comes the influence of barrel diameter of the liner in milking. A narrow bore liner ($\frac{3}{4}$-inch diameter) confines vacuum to the end of the teat throughout milking; but a wide bore liner (1 inch or more in diameter) greater than the diameter of the teat does this only during milk flow; the positive pressure of the milk within the teat and the negative pressure without expands the teat to meet the liner walls. At the stripping point, with the fall in intramammary pressure, the teat contracts and vacuum operates over the increased area of the whole teat. An idea of the magnitude of the pressure on the teat at the stripping point can be gained by assuming a teat size of 2 inches $\times$ $\frac{3}{4}$ inch, an area of 5 square inches when the pressure is approximately 37 lb. for a vacuum of 15 inches Hg. (pressure = force per unit area: 15 inches Hg. = $7\frac{1}{2}$ lb. per square inch.). Under the influence of this pressure the teat becomes oedematous (Pier *et al.*, 1956, Fig. 4A). A preliminary experiment in the live cow, however, at the N.I.R.D. (Cowie & Dodd, 1957) provided no evidence that vacum pressure penetrated inside the udder, contrary to the findings of experiments on the isolated udder (Pier *et al.*, 1956). A broad classification of liners is given below, the low tension liners including those of almost zero tension (Whittlestone, 1956a) (see p. 596).

The liners found to be associated with a higher incidence of mastitis in the controlled experiments of Watts (1951), Wilson (1952) and Dodd *et al.* (1957) were all of a different make, but were common in type in having hard mouthpieces, low tension and wide bores.

Recent experimental work on high vacuum milking by Wilson (1960) and Bratlie *et al.* (1959) shows that there is an increase in staphylococcal infection of quarters and in the incidence of erosion of the teat.

While machine factors which increase the speed of milking and assist cowmen to achieve a fast milking routine are beneficial in mastitis control, it must be realised that the machine should not be adjusted so that cowmen do not have time in which to attend their cows so that overmilking results.

To sum up, it seems best to advise the cowman to make the most of his existing equipment but to choose a liner with a soft mouthpiece and under

LINER TYPES

LOW TENSION (Wide Bore)	HIGH TENSION
*Simplex standard moulded	
*Gascoigne round, * ,, flat } All sizes: large, medium, small.	
Surge Mellotte	Units suspended from the cow.
Wallace	Hard moulded
Westfalia	(Weycroft-Macford)

WIDE BORE	NARROW BORE
(in. diam. inside barrel)	(⅞ in. diam. inside barrel)
Fullwood	U5A, U5B, U5C, Universal
Manus	
Simplex	Moulded top
Gascoigne	Double stretch.

MOULDED		EXTRUDED
Alfa Laval	Hooded	Alfa Laval 20003
,, ,,	Moulded Insert	,, ,, 20003 B
Gascoigne	Single stretch	Simplex " Fully Stretched "
* ,,	Forty	Hosier
Vaccar		Fullwood " Pedigree "
Hosier	Langton	Gascoigne Extruded
Simplex	I.C.3.	

*These liners have the same pattern of shell and are interchangeable.

tension, as there is definite controlled evidence on the importance of liner design in the control of mastitis.

(b) *Milk Flow in the Pipe System*

With the flow of milk from the teat cups there is a general fall in vacuum level at the cluster. The fall is proportional to the quantity of milk flowing, so that it is greatest during peak flow at the beginning of milking. A similar effect is produced if " choking " of milk flow takes place by the obstructive effect of narrow milk lines, milk ports in the clawpiece or milk taps. More recent designs of machine have larger diameter milk lines, etc., and are, therefore, faster milking units, since there is less vacuum drop at the cluster. Intermittent vacuum variations also occur caused by pulsation cutting off milk flow (Fig. 13).

In the bucket and the in-churn machine, milk flow moves to the receiving vessel by gravity, or almost by gravity, so that there are no other factors to affect vacuum level. In the straight releaser and auto-recorder plants (Figs. 6 and 7) milk has to flow vertically against gravity to the overhead milk line or measuring jar and a further principle affecting vacuum level at the cluster is involved. This is due to the density of the milk in this vertical column, or hydraulic head, as it is termed, and the vacuum drop below it may be calculated as approximately 1 inch Hg. for each foot of vertical flow (specific gravities mercury 13.5, milk 1.032): so vacuum drop

$$\text{per 12 inches} = \frac{1.032}{13.5} \times 12.$$

In practice, however, this hydraulic head, about 6 feet in height, is rarely composed of solid milk due to air leak which takes place between the teat and the liner mouthpiece. This leak is, however, a very variable quantity, depending on the diameter of the liner mouthpiece and the base of the teat, from 0.001 to 0.254 cu. ft. per minute of " free air " at an operational vacuum of 15.8 inches Hg. (Hughes, 1953). A constant source of air admission into the milk flow is, therefore, found necessary at the clawpiece, and an air admission hole 1/32 inch in diameter provides for the admission of 0.25 cu. ft. per minute of " free " air at an operational vacuum of 15 inches Hg. so that a mixture of air and milk, about 6 parts to 1, forms the flow, and the vacuum drop is reduced to approximately 2 inches Hg. for a vertical flow of 6 feet (Phillips, 1952), *i.e.* a vacuum level of 15 inches Hg. gives approximately 13 inches Hg. at the cluster.

However, the milk has yet to flow along the overhead milk line to the releaser (Figs. 6 and 7) and unless this is again by gravity—a fall in the milk line to the releaser of about 1 inch in 7 feet, this

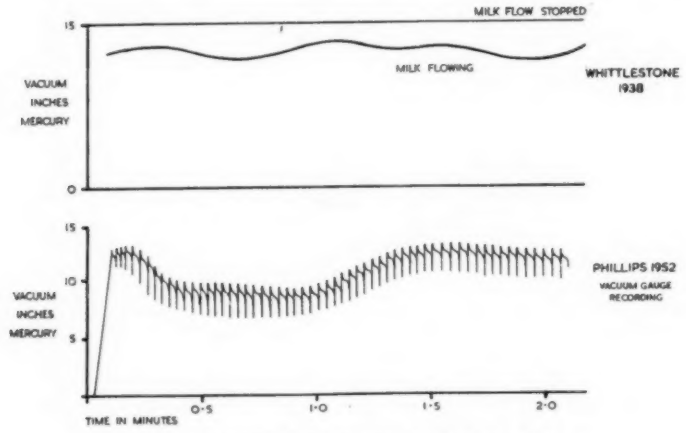

FIG. 11.—Vacuum level at teat cup during milking.

physical principle will again affect stability and level of vacuum at the cluster. Should milk flow vertically from the end of the overhead milk line to the top of the releaser the vacuum drop below will, in this case, be 1 inch Hg. for every foot of vertical flow since the flow mixture is almost solid milk. This is usually the case as the releaser has to be raised above the height of the milk line to make room for the cooler and milk churns. This is an added complication for designers of machines, but in the autorecorder the measuring jars isolate milk flow in the overhead milk line from milk flow from the cluster, and it does not constitute a serious problem. All that is required is a higher level of vacuum at the releaser to help raise the milk. This is achieved simply by the releaser having a separate vacuum pump, or receiving its vacuum supply from a branch supply close to the pump where the vacuum level is higher than that prevailing in the machine. It is in the straight releaser that the problem cannot be satisfactorily overcome as vacuum fluctuations at the releaser are transmitted direct to the cluster *via* the overhead milk line. The only satisfactory method is to install a separate milk lift to raise the milk to the top of the releaser. A makeshift adjustment sometimes seen, *i.e.* the changing of the position of the vacuum controller from the air line to the far end of the milk line so that a higher vacuum level prevails near the releaser to raise the milk, is undesirable. Milk flow is achieved at the expense of the loss of vacuum control on the machine. Similar considerations apply to the dual purpose straight releaser/autorecorder machine, and the measuring jars should be used even when milk yields are not being recorded.

Overhead milk lines are standardised at 1 to 1½ inches internal diameter for the largest machines, and milk tubes and claw ports at ⅝ inch.

(c) *Milk Flow at the Releaser*

The importance of the releaser lies in its ability to exhaust milk from the machine as quickly as it is produced. Flooding of the releaser, or of the milk line, can cause marked fluctuation of vacuum level with results similar to those of low vacuum reserve; this can be detected visually at the releaser if it is made of glass.

All designs of releaser embody a similar principle. A milk container under vacuum from a branch supply of the vacuum line draws milk to itself from the milk line. It discharges this milk by gravity to a second container which is alternately under vacuum and atmospheric pressure. The latter, the discharging or spit chamber, therefore, receives its supply of milk when under vacuum and discharges it by gravity flow when under atmospheric pressure, free of the machine. This interchange of pressure levels is operated by a system of valves which varies with the particular type of releaser. The valves may be operated (a) by a metal ball floating in the milk, rising with the intake of milk; (b) by having the discharging container pivoted at one end so that it drops when filled with milk; (c) by the simple action of a releaser pulsator to supply alternate vacuum and atmospheric air. These main types of releaser are illustrated in Fig. 13. The Alfa-Laval type is unique in that the receiving and discharging milk containers are embodied in a single vessel, this being paired so that an uninterrupted supply of milk can be handled.

III. Maintenance of the Milking Machine

(a) *Vacuum Pump*

Pump capacity depends chiefly on volume, the number of vanes, revolutions per minute and oil level. A pump should be adequate to supply the number of units in use and yet have vacuum reserve or reserve air (at negative pressure) to remove additional atmospheric air which enters the machine. Performance can be measured accurately by means of an air flow meter. Efficiency is impaired if the exhaust side is used for motive power. Additional

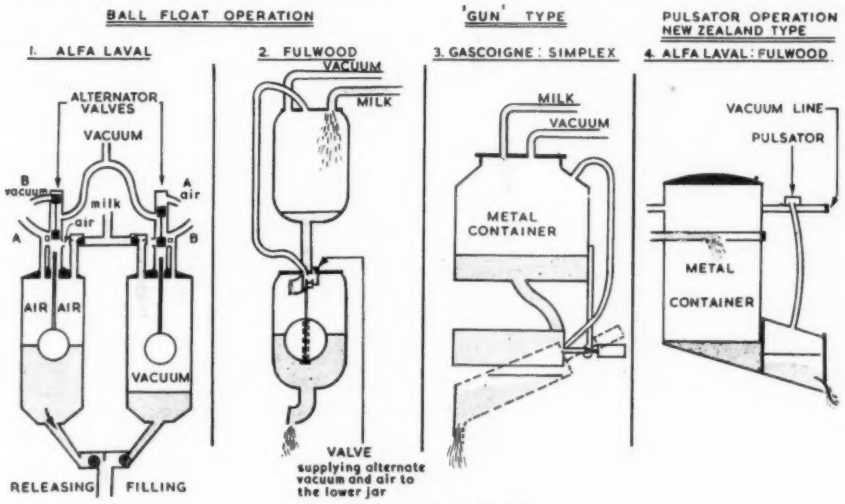

FIG. 13.—Releaser action.

uses of vacuum, such as for milk lifts, add to the load on the pump. Routine maintenance consists of the " topping up " of the oil level in oil pumps, draining the oil and flushing out periodically, and preventing belt slip in the drive from the motor. Regular yearly service is advisable.

(b) *Vacuum Controller*

The sensitivity of this unit governs the stability of vacuum level on the machine. It is, therefore, preferable to install a dead weight type fitted with a damping device; it should be regularly cleaned, not oiled, and the valve seating kept in good repair. A good controller eases the load on the pump by making the reserve vacuum or reserve air (at negative pressure) readily available, and thus economises in electrical power consumption.

(c) *Air or Vacuum Line*

Regular washing out with a hot solution of washing soda to free it from obstructions, and subsequent draining, especially of underground lines, is essential. Detergent solutions are not satisfactory as they froth and are carried into the pump. A check for air leaks with a lighted candle when the pump is running is advisable from time to time.

(d) *Pulsators*

Owing to their varied design, pulsators are best serviced by consulting the manufacturer's instruction manual. Pulsators on different units should operate in unison; their rate can be checked against a watch, but their characteristics require a recording vacuum gauge.

(e) *Teat Cup Liners*

Regular defatting by cold caustic soak is essential to their efficiency (Gardner & Berridge, 1952; Maffey, 1959). Liners of synthetic rubber are resistant to fat absorption but cannot be put under tension, and are expensive to manufacture. Longitudinal tension can be maintained if they are slackened off between milking, especially if sterilised by steam; extruded liners can be adjusted by cutting their length. Mouthpieces of extruded liners should be made up with a slight " pout " centrally placed so as to form a seal with the teat to prevent the clusters falling off.

(f) *Cluster Weights*

These should be as heavy as possible without falling from the udder, to offset teat cup crawl. Light clusters leave more milk to be removed as strippings (Dodd & Henriques, 1949) as also do clusters supported by back cords (Maddever & Egdell, 1949). They vary from 4 to 7 lb. in weight and are, perhaps, best kept as manufactured since their weight is adjusted to the vacuum pressure which holds them on the teats; and this will vary according to the bore of the liner. However, if stainless steel shells are used to replace brass shells, as in recent designs of Alfa-Laval units, the manufacturer supplies a correspondingly heavier clawpiece.

(g) *Clawpiece Air Admission Holes*

These must be kept free of obstructions (Hopkirk *et al.*, 1943).

(h) *Milk Lines*

The free flow of milk is essential for rapid milking; milk lines should be kept free by routine washing, and milk taps on bucket and churn heads checked to see they are not obstructing milk flow through wear. Milk filters, as used on skid bail machines interposed in the long milk tube, actively obstruct flow.

(i) *The Releaser*

When action is unsatisfactory this unit requires expert attention. The most common cause of trouble lies in badly seating rubber flap valves. In metal releasers the recording vacuum gauge will determine the fault accurately and promptly by its readings (Phillips, 1952).

IV. Instruments for Testing Machine Operation

(a) *The Bourdon Gauge*

This is the standard instrument fitted to machines for registering the vacuum level in inches of mercury *vacuum*. It is operated by a curved metal tube which, when under pressure, curls and moves the pointer over the scale. In practice it is usually inaccurate due to corrosion of its working parts but can usually be relied upon to indicate a rise or fall in vacuum level. It is relatively insensitive and more suited to the measurement of high pressures (Whittlestone, 1949).

(b) *The Recording Vacuum Gauge*

A sensitive portable instrument operated by a small set of bellows which, when attached by a rubber tube to the vacuum system under test, records vacuum level and its variations continuously on a revolving drum of paper (Whittlestone, 1942).

(c) *The Air Flow Meter*

This is used for testing pump capacities, machine consumption, and the consumption of separate machine components in terms of cubic feet per minute of air flow, of " free " air, *i.e.* volume of air at atmospheric pressure. In principle it depends on the amount of air which is known will flow through an orifice (in a metal plate) of given diameter. The multiorifice meter (Phillips, 1952a) or the variable orifice meter (Hughes, 1953) are examples. The former is designed for field use and methods of use in testing machine operation are published (Phillips, 1951, 1952, 1952a, 1952b).

(d) *Ruakura Milk Flow Indicator*

This is probably the most valuable instrument designed for the milking machine as far as the control of mastitis is concerned. It provides an accurate visual indication of the milk flow rate of the cow below 1 lb. per minute, which is the critical point in milking.

In construction it consists of a short cylinder in black plastic in the front of which is a circular

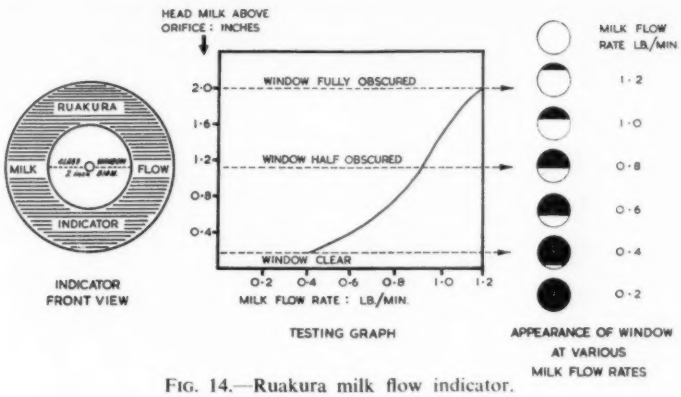

FIG. 14.—Ruakura milk flow indicator.

glass window. When connected in the long milk tube milk flows through it by means of 2 ports in the back to meter through to the window in the front, to indicate the flow rate (Fig. 14, Whittlestone, 1954).

At the stripping point of the cow, a flow rate of ½ lb. per minute, the milk falls to a point half-way down the window; it disappears completely below a flow rate of 0.2 lb. per minute when the cow is milked out (N.I.R.D., 1952b).

The Ruakura indicator is valuable in assessing the milking speeds of cows to decide the number of units per man it is safe to employ without overmilking, and for installation on a machine to assist cowmen in their routine in assessing the stripping point of their cows without udder palpation. In the former case the indicator is held in the hand, while in the latter it is fixed to the machine by a bracket at a high point where it is visible. Unfortunately it is not suitable for fixing permanently at a low level and is, therefore, unsuitable for a bucket type of machine; but it can be installed on any other. Ordinary "sight glasses" are quite unreliable as the frothing and oscillation of milk give a false impression of milk flow.

Discussion: Application of Machine Principles to Mastitis Control

So much for the complexities of the machine. How can this knowledge best be utilised in mastitis control?

The point has already been made that knowledge of the physical principles of the machine enables the investigator to instruct on efficient milking technique and influence cowmen to adopt the recommendations as nothing else will. When it is realised that cowmen, to control an outbreak, must milk efficiently, individually and as a team, over a period of weeks, sometimes in the face of continuing disease, it can be appreciated that their confidence to do so will be inspired greatly by a lucid explanation of machine principles. No cowman should be able to ask any question on his machine to which a satisfactory answer cannot be given.

The investigation is initiated by an explanation that overmilking disturbs the host-parasite relationship in favour of the parasite. How this takes place is not definitely known. Machine milking promotes erosion of the teat and increases the chances of infection by bacteria, and also damages the udder in some way when the milk flow has ceased, so that infection can proceed to invasion of the udder parenchyma.

In machine operation a balance must be struck between the milking speed of the cows and the extraction rate of the machine to fit in with the ability of the men to reach their cows before milk flow is suspended at the stripping point. A satisfactory average has been found to be a speed of 10 cows per unit per hour, or in terms of milk yield, 15 gallons per unit per hour, where the machine operates on a vacuum level of 13 to 15 inches Hg. and a pulsation ratio of 1 : 1 in the case of a bucket plant or a parlour where there are 2 stalls to one machine unit.

This can be achieved on the routine outlined by Wilson (1958) where the number of units per man does not exceed 2. This allocation is, however, flexible and can be assessed in conversation with cowmen in the form of a rough time and work study for a particular set-up.

In parlours where there is a milking unit for every stall, the unit will be idle when cows are changed, so that the throughput of cows will be approximately 8 cows per unit per hour. After the onset of the stripping point, although the amount of milk to be removed as strippings will depend chiefly on the hardness of the liner mouthpiece (from 5 to 15 per cent. of the total yield), clusters should be removed promptly, although the last pound of milk is left in the udder (palpation of the udder cistern is the cowman's guide). This is especially important with wide bore liners.

It is primarily the individual milking speed of the cows as governed by teat sphincter diameter and stage in lactation that counts, and if an outbreak of disease does not subside on the initial planning of work routine, it will mean that cowmen are not yet able to keep pace with the milking speeds of their cows. This can be checked if necessary on individual cows by the Ruakura Milk Flow Indicator interposed in the long milk tube and held in the

hand. A further adjustment in the routine will then be indicated to make this possible and resolve the outbreak. However, over some 200 outbreaks (Maffey, 1959), this was only necessary in about 20 per cent. of the outbreaks.

If the number of units is decreased it is considered that the total milking time for the herd should not exceed 2 hours, as beyond this time efficient milking is difficult.

In assessing the initial routine it is wise to take into account high vacuum levels and wide pulsation ratios as, of all machine factors, these have the greatest effect on the milking speed of the machine.

The co-operation of the representative of the milking machine manufacturer is a valuable help in checking the machine if this work has not recently been carried out. The condition in which many machines are expected to operate by farmers is astonishing. Machine service could be improved if engineers were equipped with instruments, such as a vacuum recording gauge and air flow meter, as it is impossible to test such factors as vacuum reserve and pulsation characteristic without them (Phillips, 1952a). Machine design is best kept as simple as possible to assist in maintenance (Phillips, 1956).

A few people deny the association between machine milking and mastitis (Seeleman & Obiger, 1959, at Kiel; Neave & Dodd, 1959, at Shinfield). These workers base their conclusions on experiments designed to set up mastitis in herds free from disease. This is a difficult job as such herds are usually constituted of heifers in which it is notoriously difficult to produce disease. Nevertheless, even under this type of experimentation, results have been obtained to support the view that the machine is an influence in causing mastitis; prolonged milking caused an increase in the infection rate with staphylococci (Neave & Dodd, 1959a), and a certain design of teat cup liner promoted mastitis (Dodd *et al.*, 1957); high vacuum increased the infection rate of quarters (Bratlie, 1960) in Norway.

Conclusive results have best been obtained by starting with herds where a mastitis problem actually exists and showing an improvement in one section of the herd, while the remainder of the herd serves as a control. As stated earlier, Wilson (1952) divided such a herd into 2 groups and milked half on a test liner and half on a control liner. There were 32 cases of mastitis in the test group and only 2 in the control group.

Conclusion

Mastitis to-day is not merely a question of an infectious agent gaining access to a susceptible host. Cows, it is true, are exposed to risk of infection 2 or 3 times daily throughout a lactation, but it is considered that infection is only likely to proceed to invasion, more especially with the less-adapted parasites, when some external factor has lowered the resistance of the cow (Wilson, 1958). Attention to hygiene is important in preventing the initial infection, but a really satisfactory hygienic routine under farm conditions has yet to be devised.

The most common factor which influences mastitis is milking technique, and if the veterinary surgeon can himself gain an insight into the physical principles of the milking machine, and get this over to the cowman with consequent improvement of methods, a large measure of control can be achieved.

Acknowledgments.—During the protracted period of this paper's preparation, Mr. C. D. Wilson gave unstinting advice and help at all stages.

Of the many other people who gave their assistance my thanks are especially due to Dr. W. G. Whittlestone of Ruakura, Dr. F. H. Dodd of Shinfield, Dr. E. F. Gibbs of the Engineering Dept., University of Bristol, Mr. H. W. Burry of Vaccar Ltd. and Mr. H. E. P. Webster of Alfa-Laval Ltd.

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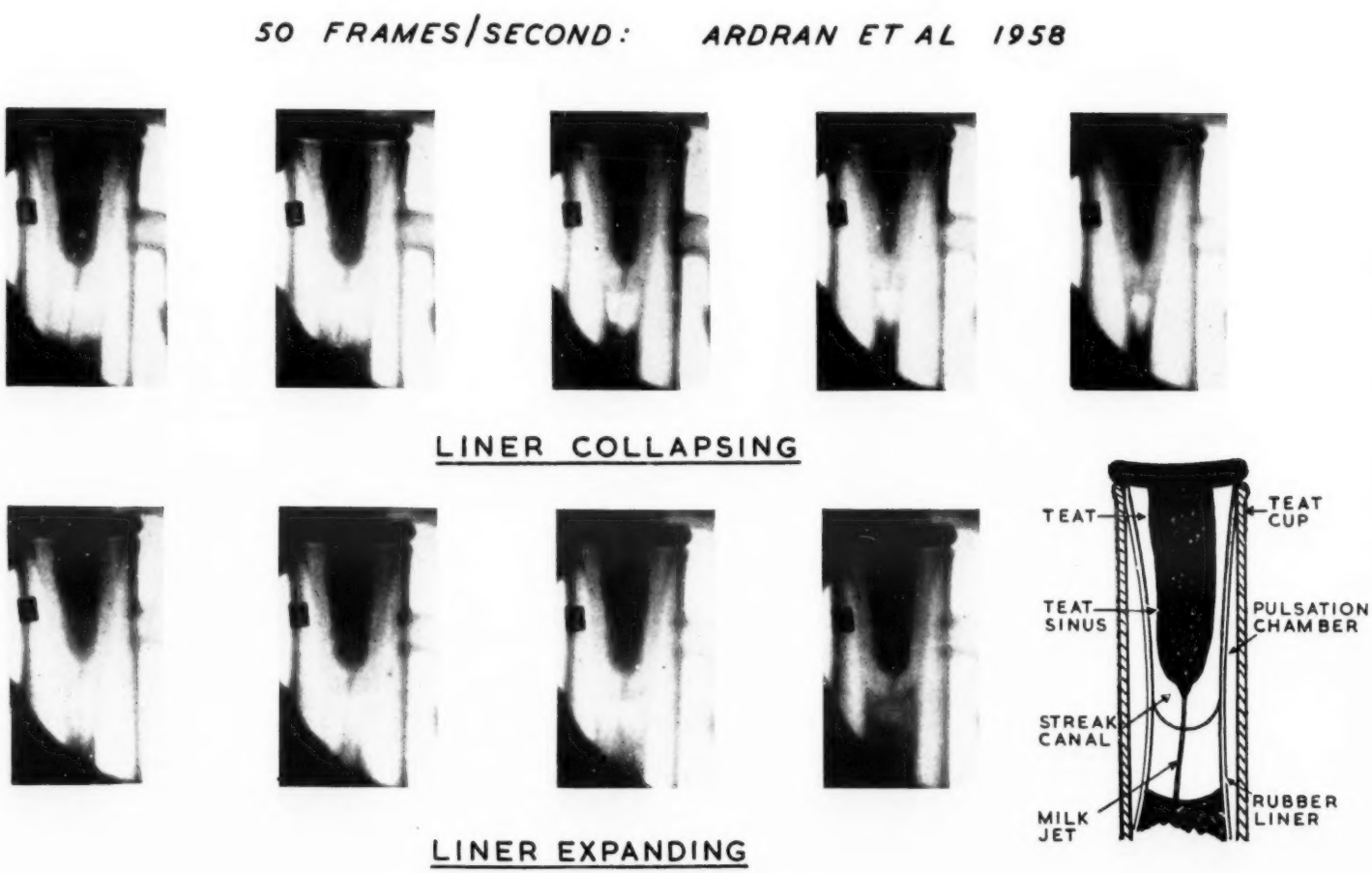

FIG. 12.—Cineradiographs of teat cup action

N. LANNEK, P. LINDBERG, A. L. OBEL, F. PERSSON AND F. SEVELIUS.—A GROSS DISEASE ENZOOTIC IN STABLE-FED HORSES WITH AN INVESTIGATION OF THE AETIOLOGICAL ROLE OF THE FOOD

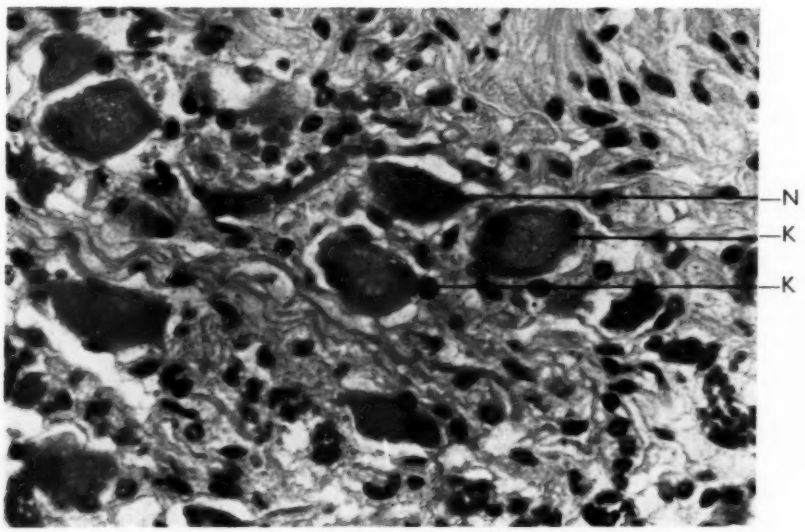

FIG. 1.—P 4528/59. Acute grass disease. Cranial cervical ganglion. Most ganglion cells are the seat of chromatolysis and vacuolisation (K). At N is seen a normal ganglion cell with numerous Nissl granules in the cytoplasm. The capillaries are markedly blood-filled. Haemalum-eosin. x 500.

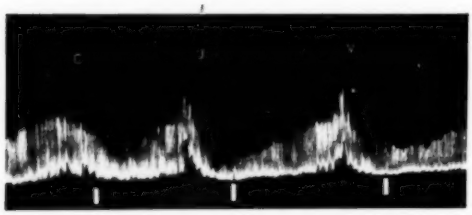

FIG. 2. Isolated rabbit intestine exposed to preparation (see the text) from suspected linseed "J" and normal linseed V shows inhibition of contractions. C is control (Tyrode's) solution. Vertical thick lines indicate rinsing of the bath*.

* We are indebted to Professor C. G. Schmiterlöw (Department of Pharmacology, Royal Veterinary College, Stockholm) for providing equipment for this examination.

A Grass Disease Enzootic in Stable-fed Horses with an Investigation of the Aetiological Role of the Food

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SUMMARY.—An outbreak of grass disease among stable-fed horses is described. Since the diet used in one of the affected stables was exactly known, food poisoning could be excluded as a possible cause after certain toxicological analyses and feeding experiments had been carried out.

The conclusions drawn seem to favour an aetiology of infection.

Introduction

GRASS disease generally occurs during the grazing season. Except for an outbreak among ponies in a coal mine, observed by Forsyth in 1927, we have not found any description of a true grass disease enzootic in horses which were kept in a stable and exclusively fed dried food products, such as hay and grain. Sporadic cases among stable-fed horses have been described (Pool, 1928) but the possibility that cut fresh grass was included in the feed could not always be excluded in these cases.

Many hypotheses have been advanced concerning the aetiology of the disease. Among the causes virus infection and food intoxication appear to be the most probable. The theory of a viral aetiology is difficult to disprove, as failure to demonstrate transmissibility experimentally may depend on such factors as the presence of immunity or technical errors. Efforts to provoke the disease by feeding grass from diseased areas have hitherto failed.

The enzootic studied by us offered an opportunity to investigate the aetiological rôle of the food. For reasons which will be further discussed below it could, in fact, be concluded that of the food products used only linseed (*Linum usitatissimum*) might have caused the disease. Linseed normally contains hydrocyanic acid (HCN), of which one part is in the free state and the other is bound in a glucoside, linamarin (phaseolunatin). The glucoside is accompanied by an enzyme which hydrolyses it into glucose, hydrocyanic acid and acetone (Dunstan & Henry, 1906; Fischer & Anger, 1919).

Juice of clover was demonstrated to have a paralysing effect on the isolated rabbit intestine (Ferguson, 1948). Working with the leaf juice of white clover, Evans and Evans (1949) showed that the active substance was probably identical with hydrocyanic acid and incriminated this poison as the cause of bloat in ruminants and grass-sickness in horses. White clover is frequently found on fields where outbreaks of grass disease occur (Greig, 1942). Intestinal paralysis is a prominent feature of the pattern of grass disease (Holman, Gordon & Pattison, 1944; Obel, 1955).

The demonstration of degeneration in the sympathetic ganglions (Obel, 1955; Mahaffey, 1959) has greatly contributed towards our knowledge of the pathogenesis.

We have found no critical approach in the literature to the question of the aetiological importance of HCN in grass disease.

History

The cases occurred in 2 stables with trotters of the American breed between September and December, 1959. The affected stables are closely situated, in a big trotting centre at Malmö in the south of Sweden. Animal tenders frequently visited other stables and the horses met daily on the training grounds and the trotting run.

In Stable 1, housing 24 horses, 2 animals died. A month later in Stable 2, 5 horses out of 12 fell ill and died within a month.

The clinical course had a sudden onset with loss of appetite, sweating, discoloured mucous membranes, slight colic, and constipation. The stomach contained large amounts of fluid. Body temperature was normal or slightly elevated. The pulse-rate was much increased before death. Six horses died after less than 3 days of illness. The seventh horse was killed in agony after 8 days.

One 10-year-old mare was thoroughly examined macroscopically and microscopically 17 hours after death. The *post-mortem* changes were as follows:—

The Physical Principles of the Milking Machine.—*Concluded.*

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The cadaver was dehydrated, with dark-coloured muscle. The body lymph nodes were normal. The spleen was moderately swollen with hyperaemic pulp. The lungs were markedly hyperaemic and moderately oedematous. Subpleurally, notably over the ganglionated cord, there were multiple petechiae. The stomach was fairly markedly dilated and filled with thin gruel-like food. The small intestines were greatly distended by gas and a red fluid. The mucous membrane was hyperaemic and in places infiltrated with haemorrhages. In the large colon, especially the left ventral and dorsal colon, was found a copious inspissated content which was dark-coloured on the surface and adhered to the intestinal wall. In the small colon there were sparse firm faecal masses, and the rectum was empty. The liver and the kidneys were normal. In the vegetative nervous system abundant minor haemorrhages were seen in the cranial cervical ganglion, along the vago-sympathetic nerve, in the thoracic part of the ganglionated cord and in the coeliaco-mesenteric ganglion.

Microscopical examination of the heart, liver and kidneys showed no pathological changes. The lungs and the spleen appeared markedly hyperaemic. The sympathetic ganglia were hyperaemic and in places infiltrated with fresh haemorrhages. Most of the ganglion cells were the seat of total chromatolysis. In some of these cells, however, there was a ring of preserved Nissl bodies peripherally in the cytoplasm. Many of the chromatolytic ganglion cells were studded over with small, closely packed, vacuoles in the cytoplasm, usually in the centre of the cell, or forming a ring near the cell membrane. The nuclei had as a rule markedly swollen nucleoli. Many of the cells had pyknotic nuclei. Only a few ganglion cells were normal (Fig. 1).

The other horses were examined macroscopically *post mortem*. The changes were similar to those described above. One horse also showed rupture of the stomach.

The enzootic ended abruptly, but in February, 1960, one horse in a third stable nearby fell ill and died after a day. Symptoms and *post-mortem* findings were similar to those described above.

In Stable 2 the food consisted of hay, oat products and linseed. The hay and the oats had been grown on the farm belonging to the owner of the stable. He had also used these products in another of his stables (Stable 4), housing about 20 horses. This stable was situated on the farm at a distance of 2 or 3 Swedish miles from the trotting establishment. It was tended by persons who never, or seldom, visited Stable 2. No disease occurred in Stable 4. The linseed, on the other hand, had been given only in Stable 2, where each horse had received ¼ to ½ kg. daily twice a week. It was prepared by heating with water on a stove to near boiling for some hours.

The linseed had a grey and dusty appearance with many crushed or otherwise damaged grains. It contained traces (34 grains per 100 g.) of corn cockle, *Agrostemma githago*.

All food components were tested for mercury with a negative result.

The composition of the food in Stable I could not be ascertained and will not be further discussed here.

Experimental

Free HCN and HCN bound in the form of glucoside (together making up "total" HCN) were determined by the methods of van der Walt (1944) and Epstein (1947).

Free HCN

Five g. of finely ground linseed are added to 100 ml. of 0.5 per cent. boiling $HgCl_2$ solution. The glucoside-splitting enzyme is destroyed at this temperature. A stream of air is forced through the solution and *via* a closed system into a flask containing 20 ml. of 0.1N NaOH. A solution of 20 ml. of 10 per cent. $SnCl_2$ is first sucked into the suspension, and thereafter 20 ml. of 10 per cent. tartaric acid. The flask containing the specimen is immediately placed on a boiling water bath and aeration is continued for 2 hours. The inspired air first has to pass through 30 per cent. KOH solution to be freed of carbon dioxide.

The NaOH solution is neutralised by adding 0.1N HCl and, according to the expected concentration of cyanide, diluted to contain about 1 μg. per ml. To 1 ml. of the solution, 0.2 ml. of 1 per cent. aqueous chloramine T solution are added. The tube is stoppered and shaken. After one minute, 6 ml. of pyridine-pyraxolone reagent (Fischer & Anger, 1919) are added and the reagents are mixed. After 20 minutes the optical density is compared with a reagent blank at 630 mμ in a Beckman B spectrophotometer and a 1-cm. cell. The concentrations are read on a standard curve prepared from known solutions.

Total HCN

The amount of linseed is added to the $HgCl_2$ solution as described for free HCN but at room temperature. The solution is allowed to stand for 7 days. The procedure is then continued as for free HCN.

Preparation for Test on Isolated Rabbit Intestine

Linseed was prepared for determination of free HCN but Tyrode's solution was substituted for NaOH. The concentration of HCN in the intestinal bath was approximately 1/100,000.

Toxicity Tests in Horses

For the toxicity tests in horses maximum liberation of HCN was achieved by heating 1 kg. of freshly-ground linseed in 8 litres of water at 60° C. for about 2 hours in a closed container. *p*H was not lower than 6.3. The amount of 0.5N HCl sufficient to lower *p*H to 4 was calculated. The horses used in the experiments were fasted for half a day, and then given the linseed suspension by stomach tube. The HCl solution was also administered at 4 to 6 intervals to give rapid liberation of HCN in the stomach. A specimen of the suspension was taken at the time of administration to determine the actual concentration of free HCN.

Linseed "J" represents the suspension used for

the horses in Stable 2. Seed V is a " normal " lot bought for control purposes.

Results

The results of exposing the isolated rabbit intestine to a preparation of linseed containing hydrocyanic acid are shown in Fig. 2.

Linseed J contained 8 mg. of free HCN and 208 mg. of total HCN per kg. The corresponding figures for seed V were 8 mg. and 254 mg.

Experimental Horse A (riding-horse, mare, bodyweight about 550 kg.) was given 8 litres of linseed suspension J on January 26th, February 9th, February 11th, February 13th and February 15th. Suspension V was given on February 2nd.

Horse B (riding-horse, gelding, bodyweight about 500 kg.) received suspension J on February 9th. February 13th and February 15th.

The amount of free HCN was 23.2 mg. per litre of suspension V, and varied between 19.8 and 21.6 mg. in J. The volume of suspension given each time was approximately 9 litres.

Except for an attack of moderate colic in Horse A on January 27th, no significant disease occurred.

One kg. of linseed J in 1 litre of water was allowed to stand in an open flask at room temperature for 17 hours. After *p*H had been lowered to about 3.5 by adding tartaric acid the suspension was boiled for 2 hours and meanwhile aerated with a stream of nitrogen gas. The *p*H was adjusted to 7.0 with sodium hydroxide, and NaCN was added to give a final concentration of 182.4 mg. of HCN per kg. of linseed. The suspension was then given to Horse B as described above. No disease occurred.

Finally, linseed J was given to a horse daily for 2 weeks. The suspension was prepared as it had been in Stable 2 with no special measures to preserve the HCN. An amount corresponding to 1 kg. of dry linseed was given each day, mixed in some oats for voluntary uptake. No disease appeared.

Discussion

The clinical symptoms in the affected horses and the observed morphological changes in the animal that was subjected to thorough *post-mortem* examination were identical with those seen in acute grass disease.

When grass disease occurs on a grazing field, it is hardly possible to know exactly what plants the horses might have eaten. The plants are, further, in a dynamic state where anabolic and catabolic phases may shift rapidly with regard to potentially poisonous substances. This makes analyses of the food or feeding tests hazardous.

The conditions are different in this respect in a stable enzootic. The composition of the diet is exactly known and, provided no changes of food have been made intentionally, it should be fairly safe to presume that the dried and stored products are essentially the same as they were a couple of weeks earlier.

In the present outbreak all food products, except linseed, had been used not only in the affected Stable 2, but also in the non-affected Stable 4. Thus, 20 horses in Stable 4 served as controls with regard to the hay and the oats. The efforts to elucidate the aetiological rôle of the food could, therefore, be concentrated on the linseed. The intestinal paralysis characteristic of grass disease might incriminate the HCN present in this grain. Analyses did not show a higher content of HCN in the suspected lot than in a normal specimen, however. In the experiments the method of preparing the linseed suspension was similar to that used in the stable before and during the time of disease, but with measures to preserve liberated HCN. The free HCN thus given to the experimental horses approximated therefore the total amount present in the seed. It corresponds roughly to half a milligram per kg. bodyweight, which is still only one-fifth of what is regarded as the minimum lethal dose for most domestic species (Garner, 1957).

The failure to produce disease in this way very probably eliminates food poisoning as the cause of the outbreaks in the stables.

Circumstances such as the sudden flare-up of the disease, and its restriction to adjoining stables with frequent personal contact, rather speak in favour of a theory of contagion.

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EXPANSION OF THE AGRICULTURAL AND VETERINARY DIVISION OF PFIZER LIMITED

The Pfizer Group of Sandwich, Kent, announce that agreement in principle has been reached for the acquisition of the assets and the present product range of the Bayer Biological Institute at Exning, Suffolk. Whilst excluding products in the canine hepatitis field, the agreement will provide for the marketing by Pfizer of veterinary chemotherapeutic agents. It is expected that the final contracts will be exchanged shortly. The addition of the facilities of the Bayer Biological Institute to those already existing in the Pfizer vaccine units at Sandwich will, it is expected, result in further progress in the field of veterinary biologicals an announcement from Messrs. Pfizer states.

Equine Virus Rhinopneumonitis: Influenza-like Respiratory Infections: "Equine Virus Abortion"

Introduction

THE following information is issued as the result of a recent meeting held at the Ministry of Agriculture, Fisheries and Food, at which discussions took place following the confirmation of the presence of lesions in two foetuses and one foal, which are indistinguishable from those reported in the literature as being characteristic of infection with the virus of equine rhinopneumonitis in the horse. These findings indicate that the virus may be present among horses in Great Britain and Ireland.

Clarification of the Syndrome

The purpose of this note is to bring to the attention of veterinary surgeons engaged in horse breeding practices, some of the important details of the virus infection of horses which is variously known by one or other of the names given above.

It is important to emphasise at the outset that a considerable amount of misunderstanding exists in the minds of many Thoroughbred owners regarding the rôle played by this virus in disease of the horse, the majority of whom associate infection with the virus as being solely concerned with the uncommon but spectacular form of the syndrome of abortion in mares, commonly called "equine virus abortion."

It is important to differentiate between a true epizootic abortion disease, such as *Brucella abortus* infection in cattle, and a syndrome in which abortion is incidental and relatively infrequent except under certain conditions.

The commonest manifestation of infection with the virus is a mild respiratory catarrh with a rise in temperature from which most horses recover in a short period. In pregnant mares exposed for the first time to infection, abortion may result.

Respiratory catarrhal infections are relatively common among almost all breeds and types of horses in autumn and early winter, and with some exceptions most of these disappear in from 3 to 5 or 6 weeks without sequelae. Sometimes foals, yearlings, 2-year-olds, and older horses are affected to about the same extent; more often the younger animals suffer rather more severely and mares and older horses are only mildly affected; in other instances there is no clear-cut pattern; some horses show the symptoms; some do not.

Nasal catarrhal conditions are not all due to the particular virus in question, but American workers consider it to be the commonest cause of contagious "colds" in young horses in autumn and winter. Strangles still occurs occasionally; simple afebrile "common colds" are met with, and migrating worm larvae may sometimes cause respiratory catarrh. Exact clinical differential diagnosis between these is difficult or impossible. Severe catarrhal infections in adult mares during autumn or winter, which spread rapidly, should be regarded as highly suspicious.

In a proportion of cases, where pregnant mares have either escaped previous infection or have developed inadequate immunity from earlier infection with the virus, abortion may follow. In earlier days, heavy draught mares suffering from what was then known as "equine influenza" might abort in a similar way.

From observations made in the U.S.A., Germany, France and elsewhere there is a concensus of opinion formed on field experience that naturally infected mares do not abort before 4½ to 5 months of gestation, but may do so at almost any time up to foaling date, with a peak incidence between about 8½ and 10 months of pregnancy. Mares abort without showing any other symptoms, membranes are rarely retained and the uterus undergoes normal involution. The foetus is typically very fresh looking and is often enclosed in intact membranes, which indicate that death had only recently occurred.

The aborted foetus, fluids and membranes contain the virus, which is relatively delicate and does not survive more than 10 to 14 days in the absence of equine tissue. On straw, concrete floors, etc., it usually dies in about 7 days, but when dried on to horse hairs it has been shown to be infective up to 42 days.

If the first oestrus after abortion, which corresponds to the "foal-heat," is missed, experience in other countries has shown that a mare can be safely covered at the next post foaling heat, *i.e.* about 1 month after the abortion and will nearly always become pregnant and foal normally. There is no evidence of any infection of the stallion or spread by means of coition.

Macroscopic Lesions

These vary in degree and frequency. In typical cases the following are seen on *post-mortem* examination of the aborted foetus:—

Slight yellow-staining of the foetal tissues, especially the feet, marked pulmonary oedema, excess pleural fluid, pericardial effusion, haemorrhages on the surface of the heart and spleen, tiny pale grey or greyish white spots under the capsule of the liver and in its substance, with a varying amount of patchy congestion. Spleen corpuscles are enlarged and the kidneys are occasionally congested. In many foetuses only a proportion of the above lesions may be present.

Microscopic Lesions

The foetal liver tissue shows areas of focal necrosis with differing degrees of infiltration with round cells and histiocytes around the focal spots. Some of the hepatic cells around a necrotic area show distinct eosinophilic intranuclear inclusion bodies. Lung sections show areas of bronchiolitis with small amounts of catarrhal exudate in affected bronchioles, and in the epithelial cells nearby eosinophilic nuclear inclusion bodies can usually

be found. Spleen sections vary, but typically there are areas of focal necrosis in the Malpighian corpuscles.

These lesions are widely held to be diagnostic of "virus abortion" and have been generally accepted in the U.S.A., the Continent of Europe and Japan, where "abortion storms" due to this virus have been reported.

"Abortion Storms"

The name "equine virus abortion" has been widely used to describe the fulminating type of the syndrome. In an occurrence of this kind, there is often a typical history of an outbreak of severe and extensive nasal catarrh in the preceding autumn or early winter, when the in-foal mares on the premises are from about 4½ to 5 months up to 7 months pregnant. Recovery takes place and during subsequent months, up to the time of foaling, abortions may take place. In the most severe instances from 40 to 60 per cent. (or even more) of the mares abort, sometimes within a period of a few weeks only.

It takes little imagination to understand how a disease with this potentiality comes to be regarded with alarm and despondency by owners, managers and veterinary surgeons, and why the recent diagnosis of its occurrence in Great Britain and Ireland is a cause for worry.

It must be clearly understood, however, that such "abortion storms" are very exceptional, and there is evidence to show that both on the Continent and the U.S.A., they are less frequent now than earlier. The probable explanation is that with more frequent movements of horses to-day, a majority of the brood mares have been infected at a younger age and have acquired a considerable degree of resistance to or immunity against the virus by the time they become pregnant and will carry their foals to full term.

In closed studs, where the mares have not been so exposed to infection, there is perhaps a risk that an "abortion storm" might occur, but it is considered that in Britain and Ireland this is unlikely.

Precautions

It is necessary to realise that if an "abortion storm" occurs on a stud, it may be already too late to take any action to arrest further abortions in the remaining in-foal mares if they happen to be susceptible. The most that can be done is to endeavour to limit the spread of the virus to other susceptible animals by normal hygienic measures.

The following are the principles on which such measures should be based:—

(1) Regard every abortion and every foal which dies up to 36 hours old as suspect until the contrary is proved.

(2) Ensure that aborted foetuses and their membranes are immobilised; forward to a laboratory for histopathological examination, or if impossible carry out a *post-mortem* examination (see later) and have the foetus and membranes destroyed by burning or deep burial.

(3) Isolate the mare and carry out good disinfection of her box with an approved disinfectant. Burn the bedding, disinfect mangers, walls, floors and drains thoroughly, and leave the box empty for 2 or 3 weeks.

(4) If abortion occurs at pasture, search for and secure the foetus and membranes and dispose as above. Remove in-contact mares from the paddock and keep separate from other mares till they foal.

(5) Allow the first *post-partum* oestrus to pass, and only allow covering at the second or subsequent oestrous period. Mares which abort at an early stage of gestation will in any case be held until the commencement of the normal covering period, which in Thoroughbreds is February 15th each year.

(6) On receiving mares back from a public stud where abortions have occurred, keep them isolated from contact with other (especially younger) pregnant mares for a period of 3 months.

(7) Regarding "autumn colds," it is not possible to devise measures which can be regarded as entirely satisfactory. Every effort should be made to segregate the pregnant mares, particularly the younger pregnant mares, from contact with the infection, but amongst barren mares and young stock there is no point in trying to limit the spread, and indeed it may be better policy to encourage all non-pregnant animals to acquire infection to enable them to establish resistance or immunity for the future.

It should be kept in mind that the major movements of mares occur:

(a) when brood mares return from the public studs after foaling and covering. They are then from a few weeks to a few months pregnant;

(b) when mares are sold privately or at public auction, *e.g.* the December Sales;

(c) when heavy in-foal mares are sent to the public studs to foal and be covered, in late winter onwards.

It is at these times that there is an added risk of spread of respiratory catarrhal disease.

Three months' strict isolation in mid-summer is usually practicable and possible, but such a period may not be easy to arrange at other times of the year. Much depends upon the local facilities, premises, etc.

Responsibilities of Veterinary Surgeons

Veterinary surgeons in equine practice will undoubtedly be asked for advice by owners who are being informed simultaneously with the appearance of these comments, that Great Britain and Ireland can be regarded as having a virus which might be rhinopneumonitis among Thoroughbred horses. The veterinary surgeon will have a responsibility not to cause undue alarm, and at the same time to urge owners to co-operate. This co-operation will essentially comprise the following:—

(1) Owners and managers should report promptly to their veterinary surgeon all abortions among their mares, preserve the foetus and membranes for examination, and carry out isolation and disinfection, as indicated earlier.

(2) Veterinary surgeons called to studs to

(*Concluded at foot of page overleaf*)

Divisional News

THE LINCOLNSHIRE & DISTRICT DIVISION

A meeting of the Division was held at the Grand Hotel, Lincoln, on March 29th, commencing at 7.30 p.m. The President, Mr. W. A. B. Barr, was in the chair, and there were present 25 members and 2 visitors.

Apologies for absence were received from 5 members.

Minutes

The Minutes of the previous meeting were read, approved, and signed as correct.

Matters Arising

1. The "Cheshire scheme" for certified crystal violet vaccinated pigs. The hon. sec. reported that he had received full details of the scheme, from B.V.A. Headquarters. However, in view of a letter from the General Secretary of the B.V.A. relating to this scheme, it was agreed not to introduce any such scheme into the area.

2. Meat inspection refresher courses. The hon. sec. reported that he had contacted B.V.A. Headquarters regarding this matter and, on the advice of the General Secretary, had contacted Mr. J. K. Shaw, of Burnley, who had agreed to assist members of the Division in conducting a course. A letter from Mr. Shaw, in which he made various suggestions as to what form the course might take, led to a lengthy discussion. It was agreed to proceed with the arranging of a course, and the hon. sec. was instructed to inform Mr. Shaw of this decision, conveying to him various points which had emerged in discussion but, at the same time, stating that members would accept his decision as to the best arrangement for the course.

Correspondence

1. From the Editor of THE VETERINARY RECORD,

Equine Virus Rhinopneumonitis, etc.—*Concluded.*

examine an aborted foetus should have ready 3 small containers of about 2 or 3 oz. capacity, each ¾ filled with 10 per cent. formol-saline fixative solution. Use protective clothing.

If it is not possible to have the foetus and membranes forwarded for laboratory examination, arrange to carry out a *post-mortem* examination of the foetus in a suitable place away from contact with horses.

Examine the foetal membranes. Oedematous membranes or those with petechiae are suspicious. Examine the feet and tissues for yellow staining, the lungs for oedema (it is generally very marked), the pleural and pericardial sacs for effusion, the heart and spleen for haemorrhages and the liver for tiny grey spots. If lung or liver lesions are found take a typical piece (or pieces) of tissue and place in fixative. The tissue should be cleanly excised and should measure not more than 1 cm. × 1 cm. × 1 cm. Pieces larger than this may not be properly fixed. The amount of fixative should be at least 4 or 5 times the volume of the tissue.

Label the containers appropriately and send to a laboratory where there are diagnostic facilities.

Have the foetal carcase and membranes destroyed by burning or burial, and disinfect the area by spraying with 3 per cent. solution of *liquor cresol sap.* or its equivalent. Advise the staff of the hygienic requirements and precautions.

(3) Among supplementary information, the following points are of interest and value:—

(a) The older the liver lesions, the more readily are they recognised macroscopically, and the converse is true. In very young lesions, the focal necrotic spots may be invisible or require a ×10 lens for recognition.

(b) Single or sporadic abortions which are not uncommon on stud farms may be due to causes other than virus infection, but nevertheless, all abortions should be regarded with suspicion. When, however, a number of abortions occur at short intervals they should be viewed as highly suspicious.

(c) Such information as is available regarding the complement-fixation test shows that it may have uses in a stud where an abortion storm is in progress, but it is not reliable in every individual mare, and cannot be relied upon to enable individual segregation to be carried out.

(d) It is not yet known whether the virus incriminated in the present cases is identical with that in other parts of the world, but it is assumed that it is likely to be so.

(e) No central legislative action is contemplated at present, but the veterinary members of the Animal Health Division of the Ministry of Agriculture, and the veterinary staffs of the Division of Veterinary Services, Department of Agriculture, in Dublin, are in close touch with the situation and will give any help and advice which may be necessary.

(f) Laboratory diagnosis and help will be readily available to the profession in the United Kingdom at the Equine Research Station, Animal Health Trust, Balaton Lodge, Newmarket, and material from the suspected foetal liver, lungs, etc., should be submitted in the fixative solution mentioned previously, together with a complete case history.

(g) There is as yet no reliable method of artificially immunising horses against this virus, nor at present are there any indications that such an immunising agent is required in these islands.

requesting the Division to supply items of "divisional gossip," etc., and also summaries of clinical papers given at divisional meetings, together with the discussions which follow. It was agreed that at each divisional meeting 2 members should record the address and the discussion. The hon. sec. was instructed to congratulate the Editor and members of the Editorial Committee on this decision.

2. From the General Secretary, B.V.A., regarding the Harry Steele-Bodger Memorial Prize. No nominations or applications were received, and it was resolved to bring up the subject again at the next divisional meeting.

3. From the General Secretary, B.V.A., drawing members' attention to a notice to be published in THE VETERINARY RECORD, relating to the Swine Fever Certified Vaccination Scheme and recommending that, since discussions between the B.V.A. and the Ministry, regarding the eradication of swine fever by slaughter were to take place in the near future, it was considered advisable that members should not participate in organising further new schemes for vaccination.

4. From the chairman of the Lincoln Careers Convention sub-committee, inviting the Division to take part in a Careers Convention to be held in Lincoln during Commonwealth Technical Training Week. The divisional P.R.O. reported that, on the advice of the President, he had provisionally accepted the invitation. Members endorsed the P.R.O.'s action by agreeing that the Division should take part.

Elections to Membership

Mr. R. C. Bownass of Whatton-in-the-Vale, Mr. T. M. Broom of Peterborough, Mr. J. B. Callaghan of Boston, Mr. H. Coulthard of Woodhall Spa, Mr. J. M. Gilmour of Sleaford, Mr. A. Gracie of Market Rasen, Mr. J. T. M. Hart of Gainsborough, Mr. R. W. J. Plenderleith of Market Rasen, and Mr. R. T. Watson of Oakham were elected to membership.

Nominations for Membership

The following nominations for membership were received: Mr. R. A. Doncaster of Waltham, and Mr. R. C. Shaw of Scunthorpe.

Arrangements for Next Meeting

The hon. sec. announced that the next meeting would take place at Grantham, probably on Wednesday, May 31st, 1961, and that Miss J. O. Joshua, F.R.C.V.S., had accepted an invitation to address members on "Virus Diseases in Dogs."

Other Business

The President announced that Pfizer Ltd. were holding a film show and reception for all members of the Division, at the Grand Hotel, Lincoln, on the evening of Wednesday, May 3rd, 1961.

Address

Following a private dinner party, members were addressed by Mr. John A. Anderson, General Secretary of the B.V.A., on "The Importance of Public Relations to the Veterinary Profession." Mr. Anderson emphasised that public relations were based essentially on the relationship established between each veterinary surgeon and his clients, and that in this respect personal appearance and the appearance of premises were all important. He also expressed the opinion that the adoption of the veterinary schools by the universities had been a major factor in promoting the best interests of the profession.

Mr. J. E. Johnson opened the discussion and a vote of thanks to the speaker was proposed by Mr. A. M. E. Carmichael.

In closing the meeting, the President expressed his thanks to members for their support in attending the first evening meeting of the Division.

MIDLAND COUNTIES VETERINARY ASSOCIATION

A general meeting of the Association was held in conjunction with the Warwickshire Veterinary Club at the Regent Hotel, Leamington Spa, on Wednesday, March 22nd, 1961, at 2.30 p.m. Twenty-one members of the Association and Club attended, and 1 visitor. Apologies for absence were received from 36 members.

Mr. A. H. Hogg, President of the Warwickshire Veterinary Club, opened the meeting and welcomed the Midland Counties Veterinary Association to Leamington Spa. Mr. T. B. Yarrow then took the Chair and thanked Mr. Hogg for the opportunity of holding a joint meeting.

Minutes

The minutes of the last general meeting, held at Ludlow on February 23rd, 1961, were read and signed.

Correspondence

A letter from B.V.A. headquarters was read concerning the Harry Steele-Bodger Memorial.

Paper by Lt.-Col. G. N. Bushman

The President then introduced the speaker, Lt.-Col. G. N. Bushman, who addressed the meeting on "The Problems of Insurance of Horses." Lt.-Col. Bushman outlined the history of insurance and explained the nature of the contract involved between the insurer and the insured, illustrating with a number of interesting and instructive case histories. The paper stimulated a vigorous discussion which was opened by Major F. Chambers. Mr. J. B. Johnston proposed a vote of thanks to the speaker, congratulating him on the clear way he had put over the insurers' view.

Other Business

Mr. J. B. Johnston told members that the dance committee had made arrangements to hold the Annual Dance at the Penns Hall Hotel, Sutton Coldfield, on Thursday, May 25th, 1961.

Mr. P. N. Hull brought up the subject of the destruction of injured horses on the race-course without the permission of the owner or trainer—could one be held liable to them for damages for so doing? Major Davenport replied that the B.V.A. were dealing with that issue. The President added that he wondered whether the B.V.A. could not deal with the question of the provision of efficient horse ambulances on race-courses.

B.V.A. Congress Programme

SUNDAY, September 3rd, 1961

Official or Scientific Programme

2.00 p.m. B.V.A. Office open (Wadham College).
4.30 p.m. Council Meeting.

Social Programme

6.00 p.m. Service at the Cathedral (Christ Church College).
8.00 p.m. Royal Counties Division Reception (till 10.00).

MONDAY, September 4th, 1961

Official or Scientific Programme

9.30 a.m. B.V.A. Congress Office open (Rhodes House).
10.00 a.m. Official Opening of Congress and Exhibitions.
11.15 a.m. Annual General Meeting.
12.30 p.m. Congress Group Photograph.
2.30 p.m. Symposium on Staphylococcal Mastitis.
The Immunity of Staphylococcal Mastitis (J. B. Derbyshire).
The Epidemiology of Staphylococcal Mastitis (I. Davidson).
Treatment (C. D. Wilson).
Chairman : I. H. Pattison.
Opener : S. J. Edwards.
2.30 p.m. Protection Against Canine Virus Diseases in Great Britain.
Speaker : W. Mansi.
Chairman : A. C. Dixon.
Opener : R. Hanscombe.
5.00 p.m. Films.

Social Programme

7.30 p.m. Civic Reception and B.V.A. Dance (till 1.00 a.m.).

Tours

Note : College tours available throughout the day.
1.45 to 6.00 p.m. Excursion to Huntley and Palmers, Reading (including Tea).

TUESDAY, September 5th, 1961

Official or Scientific Programme

9.00 a.m. Symposium on Recent Advances in the Treatment and Control of Intestinal Parasites.
Treatment of Domestic Animals.
Recent Advances in Anthelmintics (T. E. Gibson)
Mechanisms in Helminth Infections (E. J. L. Soulsby).
Chairman : N. S. Barron.
Opener : J. A. Pasfield.
9.00 a.m. Some Aspects of Dog Nutrition (R. Gordon Booth)
Chairman : G. N. Henderson.
Opener : A. N. Worden.
10.30 a.m. Further Experiences with Cage Birds (L. O. Arnall).
Chairman : R. H. Axworthy.
Opener : O. Graham-Jones.
11.45 a.m. Plenary Session. International Collaboration (A. W. Stableforth) *Chairman :* S. L. Hignett.
2.30 p.m. Meeting of Association of Veterinary Food Hygienists.
2.30 p.m. The Biological Basis for Precautions in Veterinary Radiography (R. H. Mole)
Chairman : J. Deans Rankin.
Opener : E. F. Lewis.
3.45 p.m. Diseases Associated with Broiler Rabbits (D. C. Ostler).
Chairman : H. A. Crawshaw.
Opener : S. T. Harriss.
5.00 p.m. Films.

Social Programme

7.15 for 7.45 p.m. Annual Banquet.
(Evening) Theatre Party, Oxford.

Tours

Note : College tours available throughout the day.
9.15 a.m. Excursion to Morris Motors (including lunch).
11.30 to 6.00 p.m. Excursion to B.O.C.M., Stoke Mandeville.
2.30 to 6.00 p.m. Excursion to Blenheim Palace.

WEDNESDAY, September 6th, 1961

Official or Scientific Programme

9.00 a.m. Safe Use of Pesticides in the United Kingdom (E. J. Miller).
Chairman : J. W. R. Pearce.
Opener : J. L. McGirr.
9.00 a.m. Broiler Calves (J. Wilson)
Chairman : S. L. Hignett.
Opener : J. Makinson.
10.15 a.m. The Use and Abuse of Mineral Supplements (R. Allcroft).
Chairman : H. F. C. Hebeler.
Opener : J. A. A. Watt.
10.15 a.m. Variations in Susceptibility to Infection with *Mycobacterium johnei* (R. L. Chandler).
Chairman : T. C. Denholm.
Opener : E. J. H. Ford.
11.45 a.m. Plenary Session : Veterinary Surgery and Orthopaedics (J. Trueta). *Chairman :* S. Jennings.
2.00 to 6.45 p.m. Visit to Surgeries at Wallingford, Reading and Newbury (including Tea).
2.00 p.m. Visit to Grassland Research Centre, Hurley.
2.30 p.m. Pathogen-free Pigs for Research and the Practical Control of Pig Diseases (A. O. Betts).
Chairman : J. A. de Garis.
Opener : M. R. McCrea.
5.00 p.m. Films.

Social Programme

8.00 p.m. Ladies' Guild Dance (till 1.0 a.m.).
(Evening) Theatre Party, Oxford.

Tours

Note : College tours available throughout the day.
2.00 to 6.15 p.m. Excursion to Witney Blanket Factory and tour of the Cotswolds (including Tea).

THURSDAY, September 7th, 1961

Official or Scientific Programme

9.15 a.m. Symposium on the Provision of Laboratory Diagnostic Services.
Introduction (D. L. Hughes).
Structure and Availability (R. M. Loosmore).
Training of Workers (W. L. Weipers).
The Veterinary Surgeon in Practice and His Need of Laboratory Services (J. B. White)
Chairman : A. M. Graham.
9.15 a.m. Symposium on Equine Practice.
Clinical Observations on Chronic Lameness in the Horse's Foot (J. E. Gray).
Clinical Aspects of Equine Brucellosis (J. S. M. Cosgrove).
A Review of the Therapeutic Use of Corticosteroids in Equine Lameness (J. H. Wilkins).
Chairman : H. Bell.
Opener : A. C. Fraser.
11.45 a.m. Plenary Session : Recent Advances in the Control of Viral Epizootics by Vaccination Techniques (H. Frenkel.) *Chairman :* A. G. Beynon.
1.45 p.m. Visit to M.R.C. Unit, Harwell (returning 6.00 p.m.)
2.30 p.m. Symposium on Salmonellosis in Man and Animal.
Salmonellosis in Calves (E. A. Gibson).
Human Salmonellosis in Relation to Infection in Animals (N. S. Galbraith).
Chairman : R. Lovell.
Opener : A. Buxton.
5.00 p.m. Films.
8.00 p.m. International Radio Discussion on Pig Diseases.
Chairman : A. Laing.
Participants : R. F. W. Goodwin, A. M. Graham, F. A. Edgson.

Social Programme

2.00 p.m. Golf Tournament, Frilford Heath.
(Evening) Theatre Party at Royal Shakespeare Theatre, Stratford-on-Avon (" Romeo and Juliet") and Alumnus Dinners.

Tours

Note : College tours available throughout the day.

FRIDAY, September 8th, 1961

Official or Scientific Programme

9.00 a.m. Symposium on the Role of Wild Life in the Dissemination of Disease.
General Introduction and Veterinary Problems (A. McDiarmid).
The Effect of Disease on Wild Mammals and Birds (H. V. Thompson).
The Role of Wild Life in the Epidemiology of Certain Human Diseases (R. H. A. Swain)
Chairman : W. S. Gordon.
Opener : A. R. Jennings.

9.00 a.m. Symposium on Some Modern Feeding Methods.
The Early Weaning of Lambs (C. Spedding).
Self-feed Silage (R. R. Turner).
Zero Grazing (G. V. Runcie).
Chairman : R. M. Loosmore.
Opener : S. L. Hignett.

11.45 p.m. Symposium on Tissue Grafting.
The Relevance to Veterinary Surgery of Modern Work on Tissue Grafting and Immunity (J. M. Payne).
Skin Grafting in the Treatment of Granulating Wounds of the Limbs of the Horse (P. A. Neal).
Chairman : L. G. Anderson.
Opener : P. M. Biggs.

2.00 p.m. Visit to A.R.C. Field Station, Compton (returning 6.30 p.m.).

2.30 p.m. Symposium on Poultry Diseases.
Clinical Diagnosis of Poultry Diseases (W. P. Blount).
The Control of Poultry Diseases (J. D. Blaxland).
Chairman : W. E. Beattie.
Opener : P. J. Dalton.

5.00 p.m. Films.

Social Programme

8.30 p.m. President's Reception (till 1.00 a.m.).

Tours

Note : College tours available throughout the day.

9.30 a.m. Excursion to Whipsnade (returning 6.00 p.m.).

2.00 p.m. River trip to Abingdon, returning by coach at 6.00 p.m.

SATURDAY. September 9th, 1961

Official or Scientific Programme

10.00 a.m. Adjourned A.G.M. and Close of Congress, followed by First Meeting of Council, 1961–2.

CONGRESS NOTES

Golf Tournament

Golf tournaments for the Simpson Trophy for men and the Dunkin Trophy for ladies will be played at Frilford Heath Golf Club (7 miles from Oxford on the Wantage Road) at 2.30 p.m. on Thursday, September 7th. The green fee will be 10s. per head and tea will cost 2s. 6d. Applications for entry, together with a remittance for 12s. 6d., should be made to: Mr. I. Meikle, 14, Queen's Road, Reading, Berkshire.

Theatre Parties, Oxford, September 5th and 6th

A block booking will be arranged at the New Theatre and/or Oxford Playhouse for each of the above evenings. Tickets will be available on application to the Congress Office at Oxford.

Photography Exhibition

A meeting and exhibition of photography and cinematography will take place on Tuesday, September 5th.

Parking of Cars in Oxford

Parking of cars is difficult in Oxford but the City of Oxford police have undertaken to assist. A list of parking places will be given in the Congress programme which will include both day and night parking facilities and a windscreen sticker has been authorised. Space has been reserved for up to fifty cars at Messrs. Morris Garages Ltd., St. Aldates, Oxford, at a cost of 30s. for the week. Those wishing to avail themselves of this facility should make early application direct to the garage.

A NEW B.V.A. HANDBOOK

A new handbook, entitled *A Guide to Pregnancy Diagnosis and the Investigation of Infertility in Cattle* has just been published by the Association. This is an authoritative and up-to-date text which will be of great service, especially to veterinary surgeons in large-animal practice. It is available to members of the B.V.A. free of charge on application to headquarters. The price to non-members is 7s., and to students 3s. 6d., post free.

THE R.C.V.S. TRUST

The Trust has recently confirmed the award of a P.I.D.A. Senior Fellowship, value £1,500 per annum, to Dr. P. J. Dziuk for research into problems connected with artificial insemination in pigs. This work will be carried out in the Agricultural Research Council Unit of Reproductive Physiology and Chemistry at Cambridge.

Dr. Dziuk is a graduate of the University of Minnesota and is at present Assistant Professor of Animal Physiology in the University of Illinois where he has carried out important research in the field of artificial insemination.

RABBIT CLEARANCE

At the Magistrates' Court at Haywards Heath on June 5th Messrs. Willows & Willows Ltd., of Northlands Wood, East Sussex, were fined £40 and 10 guineas costs for failure to control the rabbits on their land. This was the first prosecution of its kind to be taken under the Agriculture Act, 1947, and the Pests Act, 1954.

Despite reminders from the Ministry of Agriculture no proper steps were taken to deal with the rabbits on 20 acres of land at Northlands Wood. Eventually, the Ministry's officers went in with dogs and shot 14 rabbits, and gassed and blocked 280 rabbit holes. Messrs. Willows & Willows were not a member of their local rabbit clearance society. This case may well be the forerunner of other prosecutions says a Ministry press statement.

XUM

News and Comment

R.C.V.S. DAY

There was a large attendance of members of the profession and their families at all the ceremonies in Edinburgh on Royal College of Veterinary Surgeons' Day, June 7th. A full account will be given in an early issue of THE VETERINARY RECORD.

The result of the Council elections announced at the Annual General Meeting which formed part of the Day was as follows:—

Montgomerie, R. F.	1,372	Elected for four years
Anderson, L. G. ...	1,302	" " " "
Singleton, W. B. ...	1,099	" " " "
Lovell, R. ...	1,076	" " " "
Mitchell, T. M. ...	887	" " " "
Wilson, C. D. ...	843	not elected
Atkinson, G. ...	719	" "
Sumner, K. C. ...	671	" "

The total number of voting papers received was 1,823 of which 235 were returned by overseas members and 21 were declared invalid.

All the existing members appointed by the Privy Council were re-appointed for a further term of 4 years, as were the existing representatives of the Universities of Cambridge, Glasgow and London. In the case of the University of Bristol, Professor C. W. Ottaway returned to the Council in the place of Professor K. E. Cooper.

New President of the R.C.V.S.

During the Council meeting which followed the Annual General Meeting, at a special meeting of Council, Mr. L. G. Anderson, the Junior Vice-President, was elected President for the year 1961/62, and will remain in office until June 5th, 1962. Sir John Ritchie became Senior Vice-President and Professor H. G. Lamont was elected Junior Vice-President. Mr. J. B. White was re-elected Treasurer.

A biography of Mr. Anderson will be published at an early date.

GREYHOUND RACING ASSOCIATION LUNCHEON

The G.R.A. held its annual luncheon at the Savoy Hotel, London, on the occasion of the draw for the 31st Greyhound Derby. The Chairman, Mr. Francis S. Gentle, C.B.E., presided, and the guest of honour was the Bishop of Chester. Among the very large company which included such sportsmen of note as Sir Jack Hobbs were a number of members of the profession. Proposing the toast to the Guests, Mr. Gentle referred amid applause to the progress which had been made in veterinary medicine and surgery within recent years, evidencing a notable surgical operation on a greyhound which had afterwards raced with success.

PROFESSOR J.-M. GUERIN

Professor Jean-Marie Guerin who has just died in Paris at the age of 89, gained world-wide distinction for his discovery, in association with Professor Calmette, of the B.C.G. vaccine against tuberculosis. The discovery resulted from Professor Guerin's perseverance in working with a virulent bacillus from cows until it became stable and inoffensive.

Originally he studied veterinary medicine, and in 1897 worked at the Pasteur Institute where later he became director. He is said to have worked for 36 years in association with Professor Calmette in perfecting B.C.G. vaccine which was first used for children early in this century. He became President of the French Veterinary Academy and in the course of his life was honoured by many Universities and learned bodies.

HOLIDAY EXCHANGES

France

Exchange accommodation is sought for the following children: Martine Chapeau (aged 7) from the Sarthe region; Philippe Marcillaus (aged 13) from Vienne; Jean-Piere Bonaiti (aged 15) from Doubs; and Michel Craplet (aged 15) from Seine.

There are also a number of requests for accommodation as a paying guest: Mlle. Auvolat (aged 15) from the Savoie region; Catherine Roy (aged 16½) from Constantine; Marie-Claude Berger (aged 16) from Seine; and Rene Hermitte (aged 14) from Maroc who would like to come to England on an "*au pair*" basis.

Members of the profession who would like to take part in this holiday scheme are asked to contact Mrs. E. M. Stobo of 211, Yarborough Road, Lincoln.

Switzerland

There have been a number of requests from students wishing to see practice in Britain during the long vacation, and veterinary surgeons who have accommodation to offer are asked to write to Mr. E. P. Mount, Vice-President of the I.V.S.U., Students' Union Society, Hawkshead House, Hawkshead Lane, North Mimms, Hatfield, Herts.

UNIVERSITY NEWS

Edinburgh

The undermentioned candidates have passed in the subject of Pathology, Bacteriology and Immunology of Part I Examination for the Diploma in Tropical Veterinary Medicine (D.T.V.M. Univ. Edin.):—

Ghoshal, Nani G., G.V.S.C. (CALCUTTA); Macfarlane, Iain M., M.R.C.V.S.; Richards, Benjamin G., B.V.SC. (PUNJAB), M.R.C.V.S.

The undermentioned candidate has passed in the subject Tropical Veterinary Parasitology of Part I Examination for the D.T.V.M. Univ. Edin.:—

Gaheen, Saleh, M.S., DIP.VET.SCI. (KHARTOUM).

Liverpool

Promotions. At a recent meeting of the Council of the University of Liverpool the following appointments, to date from October 1st, 1961, were approved:—

Reader in Veterinary Surgery (Animal Husbandry),

Dr. J. O. L. King, B.SC. (AGRIC.), M.V.SC., PH.D., M.R.C.V.S.

Senior Lecturer in Veterinary Anatomy, Mr. J. W. Dransfield, M.V.SC., M.R.C.V.S.

Resignations. Dr. A. Wright, B.SC., PH.D., Lecturer in Veterinary Histology from May 31st, 1961.

Mr. P. J. N. Pinsent, B.V.SC., M.R.C.V.S., Lecturer in Veterinary Medicine (Farm Animals) from September 30th, 1961.

Dr. A. H. Sykes, B.A., PH.D., Lecturer in Veterinary Physiology from September 30th, 1961.

Retirement. Mr. H. V. Hughes, B.V.SC., M.R.C.V.S., D.V.H., Reader in Veterinary Anatomy, retires on September 30th, 1961, and a presentation ceremony to mark the occasion will be held on Wednesday, June 28th, 1961.

Toronto (Ontario Veterinary College)

Awards of the degree of Master of Veterinary Science at the June Convocation, 1961, included the following members of the Royal College of Veterinary Surgeons:—

A. F. Fraser, whose thesis is entitled "Studies Concerning Reproduction in the Male Goat."

K. J. Betteridge, whose thesis is entitled "An Investigation of Some Methods of Assessing Ovarian Activity in Swine."

THE REGISTER OF VETERINARY SURGEONS

Under the provisions of Section 25 (4) of the Veterinary Surgeons Act, 1948, the name of Mr. Hari Kishan Mehra, Moti-Mahal Road, Lasker, Gwalior, India was restored to the Register of Veterinary Surgeons on June 6th, 1961.

THE ASSOCIATION OF VETERINARY STUDENTS

A meeting of the A.V.S. Council was held at the Royal Veterinary College on May 27th and 28th. Delegates from all the constituent colleges were present, with Mr. P. Bardgett, President of the Association, in the chair.

Matters discussed included affiliation with the B.V.A., veterinary education, and the exchange of foreign students wishing to see practice in Great Britain.

R.C.V.S. OBITUARY

We record with regret the death of the following member of the profession:—

BROWN, James Cox, 104, Harehills Avenue, Leeds, 8, Yorks. Graduated from Glasgow Veterinary School, July 21st, 1934. Died September 6th, 1960.

PERSONAL

Mr. David Nunneley of Northampton has been adopted as prospective Liberal candidate for the town. The ceremony took place at a meeting of the Liberal Club, and Mr. Nunneley's candidature was moved by the Chairman of the local Liberal Association.

Births

JEMSON.—On May 21st, 1961, at Devizes, to Heather, wife of David Jemson, M.R.C.V.S, a daughter, Charlotte, a sister for Joanna.

SEWELL.—On May 27th, 1961, to Cynthia, wife of M. M. H. Sewell, M.A., VET.M.B., M.R.C.V.S., of the Federal Department of Veterinary Research, Vom, Northern Nigeria, a daughter, Rebecca Ann, sister for Marybeth and Ruth.

STEVENSON.—On June 12th, 1961, to Jean, wife of R. B. Stevenson, B.SC., M.R.C.V.S., of Amery Farm, Alton, a daughter, sister for Fiona.

COMING EVENTS

June

19th (Mon.). B.S.A.V.A. METROPOLITAN REGION. Meeting at the Royal Society of Medicine, 1 Wimpole Street, London, W.1.

22nd (Thurs.). ASSOCIATION OF VETERINARY FOOD HYGIENISTS. Meeting at Forfar, Angus (to visit the new slaughterhouse). Members should assemble at the Municipal Buildings, Castle Street, 2.30 p.m.

ESSEX VETERINARY SOCIETY. Special Meeting in the Committee Room of the M.A.F.F. Offices, Beeches Road, Chelmsford, 7.30 p.m.

28th (Wed.). LINCOLNSHIRE AND DISTRICT DIVISION. Annual General Meeting at the George Hotel, Grantham, 2.15 p.m.

LAKELAND VETERINARY ASSOCIATION. Summer Meeting at Penrith.

30th (Fri.). LANCASHIRE VETERINARY ASSOCIATION. Summer Meeting at Evans Medical Ltd., Research Laboratories, Speke, 2.30 p.m. Reception and Dinner at the Hanbury Restaurant, Liverpool, 6.15 p.m.

July

5th (Wed.). A.V.T. & R.W. (NORTHERN REGION). Summer Meeting at the Veterinary Investigation Centre, Quarry Dene, Westwood Lane, Leeds, 16, 12 noon.

September

2nd (Sat.). STREATLEY '58 CLUB REUNION. Annual Dinner at "Ye Miller of Mansfield."

3rd to 9th (Sun. to Sat.). 79th Annual Congress and Exhibitions of the British Veterinary Association at Oxford

7th (Thurs.). ROYAL VETERINARY COLLEGE ASSOCIATION. Annual Dinner during the B.V.A. Congress at St. Edmund's Hall, Oxford.

ADDRESSES OF DISEASE INFECTED PREMISES

The list given below indicates, first the date on which disease has been confirmed, followed by the postal address and local authority.

Anthrax

June 6th, 1961. G. F. Grevett, Deep Meadows, Milldown, Blandford Forum, Dorset (Mink). DORSET.

June 6th, 1961. Trustees of the late R. Graham, Pitreuchie Farm, Forfar, Angus (Parish Forfar). ANGUS.

June 9th, 1961. Mrs. E. M. Darby, Marholm Farm, Marholm, Peterborough, Northants (Parish Marholm) (Cattle). SOKE OF PETERBOROUGH.
June 9th, 1961. A. R. Gates, 136, Finedon Road, Irthlingborough, Wellingborough, Northants. Disease at: The Park Meadows, Irthlingborough (Parish Irthlingborough) (Cattle). NORTHAMPTONSHIRE.
June 12th, 1961. W. B. Rough, Adams Farm, Graffham, Petworth, Sussex (Parish Graffham) (Cattle). WEST SUSSEX.

Foot-and-Mouth Disease

June 7th, 1961. S. Prout, Tregadillett, Launceston, Cornwall. CORNWALL.

Fowl Pest

June 6th, 1961. H. R. Hubbard, Rectory Cottage, Fakenham Magna, Thetford, Norfolk. WEST SUFFOLK.
June 7th, 1961. J. Shaw, 11, Stanworth Terrace, Withnell, Chorley, Lancs. Disease at: Bolton Road Side of Stanworth Quarry, Withnell, Chorley, Lancs. LANCASHIRE.
June 7th, 1961. Mrs. M. E. Wortley, Hall Farm, Fakenham Magna, Thetford, Norfolk. WEST SUFFOLK.
June 10th, 1961. W. W. Coukland, Green Farm, Bacton, Stowmarket, Suffolk. EAST SUFFOLK.
June 10th, 1961. R. W. Clarke, Fron Houl, Frochaf, Welshpool, Mont. MONTGOMERYSHIRE.
June 12th, 1961. D. C. Donaldson, Farthingstone House, Farthingstone, Towcester, Northants. NORTHAMPTONSHIRE.

Swine Fever

June 6th, 1961. C. G. Harrison, East Riding Hotel, St. Hilda Street, Sherburn, Malton, Yorks. YORK, EAST RIDING.
June 6th, 1961. H. David, 26, Crown Road, Kenfig Hill, Bridgend, Glam. GLAMORGAN.
June 6th, 1961. A. Barlow, Littlewood Hall Farm, Croston, Preston, Lancs. LANCASHIRE.
June 6th, 1961. W. C. Brooks, Rossall Grange Farm, Fleetwood, Lancs. LANCASHIRE.
June 7th, 1961. E. Buxton, Home Farm, Teddesley, Penkridge, Stafford. STAFFFORDSHIRE.
June 7th, 1961. J. L. France, Well House Farm, Raikes Road, Thornton, Blackpool, Lancs. LANCASHIRE.
June 7th, 1961. A. Gordon, Pencraig Farm, Pontfadog, Wrexham, Denbighshire. DENBIGHSHIRE.
June 7th, 1961. T. Wright, Oak Villa, Strensall Road, Earswick, York. YORK, NORTH RIDING.
June 7th, 1961. J. W. Pinniger, Haycombe Farm, Sutton Veny, Warminster, Wilts. WILTSHIRE.
June 7th, 1961. W. Ansen, 6, Old Cardiff Road, Maesglas, Newport, Mon. Disease at: The Piggery, Mendalgief Road, Newport, Mon. COUNTY BOROUGH OF NEWPORT.
June 8th, 1961. F. T. Marshall & Sons, Fencote House, Great Fencote, Northallerton, Yorks. YORK, NORTH RIDING.
June 8th, 1961. W. Park, Mardon, Cornhill-on-Tweed, Northumberland, NORTHUMBERLAND.
June 8th, 1961. B. & H. Peart, Martins Farm, Hindolveston, Dereham, Norfolk. NORFOLK.
June 8th, 1961. N. Jones, Hollyberry Farm, Knolton Bryn, Wrexham, Denbighs. FLINTSHIRE.
June 8th, 1961. F. Ellis, Troy Fold Farm, Coppull Moor Lane, Coppull, Chorley, Lancs. LANCASHIRE.
June 8th, 1961. W. Bradley, Lower Kilshaw Farm, Carleton, Poulton le Fylde, Blackpool, Lancs. LANCASHIRE.
June 8th, 1961. L. Cook, Francis Green Farm, Ribchester, Preston, Lancs. LANCASHIRE.
June 8th, 1961. K. Lyons, The White Hart Hotel, Wolverhampton Road, Penkridge, Stafford. Disease at: The Quarry Bank, Penkridge, Stafford. STAFFORDSHIRE.
June 8th, 1961. G. A. Evans, The Mount, Whitegreave, Stafford. STAFFORDSHIRE.
June 8th, 1961. W. Yale, 16, Mill Street, Stafford. Disease at: Castle Fields Allotments, Stafford. BOROUGH OF STAFFORD.
June 8th, 1961. A. H. Evans, Smithy Farm, Bronington, Whitchurch, Salop. FLINTSHIRE.
June 9th, 1961. T. R. Walker, 5, Hargreave Terrace, Darlington, Co. Durham. COUNTY BOROUGH OF DARLINGTON.
June 9th, 1961. S. A. Harrison, Black Hall Farm, Isleham, Ely, Cambs. CAMBRIDGESHIRE.
June 9th, 1961. V. J. Hucker, 137, Smallholding, Rodbaston, Penkridge, Stafford. STAFFORDSHIRE.
June 9th, 1961. R. S. Bates, Four Winds, Walter Avenue, St. Annes, Lytham St. Annes, Lancs. LANCASHIRE.
June 9th, 1961. R. F. Bethell, Huggarts Farm, Brindle, Chorley, Lancs. Disease at: Willowdene, Radburn, Brindle, Chorley, Lancs. LANCASHIRE.
June 9th, 1961. G. Dand, Moorhouse Farm, Hauxley, Amble, Morpeth, Northumberland. NORTHUMBERLAND.
June 12th, 1961. H. Metcalfe, Whitecliffe Lodge, Ripon, Yorks. Disease at: Low House Farm, Aldborough, Yorks. YORK, WEST RIDING.
June 12th, 1961. R. Crawford, Dumbuck Farm, Milton by Bowling, Old Kilpatrick, Glasgow. DUNBARTONSHIRE.
June 12th, 1961. W. Owen, 8, Alyndale, Hope, Wrexham, Denbighshire. Disease at: Bryn-y-Grog, Hope, Wrexham. FLINTSHIRE.
June 12th, 1961. J. Miller, 2, Warton Street, Lytham St. Annes. Disease at: Railway Allotments, Station Road, Lytham. LANCASHIRE.
June 12th, 1961. T. Eastham, Rowley Fold Farm, Samlesbury, Preston, Lancs. LANCASHIRE.
June 12th, 1961. K. Fryatt, Old Vicarage Farm, Snape, Bedale, Yorks. YORK, NORTH RIDING.

Letters to the Editor

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

The Reform of Veterinary Education

Sir,—The difference between a man who has been to a university and one who has studied at a technical college is not far to seek. The university man is the product of a system of education which is designed to turn out men of mark; he is a man who has acquired the ability to reason from first principles, his outlook is broad and his interests wide, and he has been especially trained to play a leading part in the life of the community. A technical education is merely a practical one, and its aim is to do no more than produce men who are skilled in the application of a particular science. It does not pretend to teach a way of life and no stay at a technical college, however prolonged, could endow a student with the attributes of a university education.

The peculiarities of the teaching at a university, which set their particular stamp on a man, are equally manifest and clear. University teaching is remarkable for the breadth of its approach, its insistence on a sense of perspective, the inculcation of the idea that the arts, science and commerce are all mutually interdependent. It is vividly conscious of the shortness of the time available for the education of the student and, in consequence, is primarily concerned with imparting first principles. To the university mind irrelevant detail, which could obscure the understanding of a fundamental concept, is far better relegated to its proper place in the text-book, which, once again, to the university mind is always conceived as being close at hand for instant reference. This attitude is in sharp contrast to the one adopted

at the technical college where the text-book is regarded as education itself and therefore as something to be absorbed in its entirety.

The object of veterinary education is to turn out university men who are also veterinary surgeons, and as it stands at the moment at the London College, and no doubt at many more colleges besides, neither the curriculum nor the individual disciplines are in any condition to achieve this aim.

As far as the individual disciplines are concerned, the majority consist of an extraordinary conglomeration of modern thought and ancestral lumber, which is more than ready for the pruning hook, and whose communication to the student in a completely unedited form is associated with almost no attendant profit.

Other disciplines owe their origins to very humble beginnings, but as the years have gone on they have been allowed to assume increasing size and importance until, in their present form, they not only mask the common end in view, but are actually impediments to the attainment of a worthwhile veterinary education.

Some plants are poisonous and it is essential for the student to be able to recognise their appearance and be conversant with their habitat. But to make the existence of poisonous plants an excuse for embarking on an extensive course of pure botany is not only to have lost all sense of direction, but is to be close to bringing the whole system of education into ridicule. More important, these intellectual excursions waste irreplaceable time, uselessly exhaust the student and divert his attention from the consideration of those things which might evenutally make him into an educated man.

No farmer to-day would dream of asking the advice of a veterinary surgeon on the construction of cow sheds or the digging of drains; in the last 50 years firms have grown up who are specialists in this field and it is to one of these he would apply. As a consequence, the acquisition of detailed information on roofing materials and the efficient ventilation of barns not only adds nothing to a student's professional ability but absorbs energy which could be far more profitably employed. The brain has tracts and the liver of the pig 5 lobes, but the object of university education is the production of a man complete. As much again for the litany of the 36 breeds of British sheep and the doxology of atomic weights.

To argue that teaching in broad outline and the relegation of details to the text-book can only lead to the production of empirics is not to understand the nature of empiricism. He who has so firm a grasp on the basic principles of any particular science that he can argue from general concepts to particular cases is not an empiric but a soundly educated man. In order to accommodate itself to the requirements of modern times the Church threw overboard its insistence on a thorough grounding in Greek and Hebrew; in so doing it did not drown itself in a welter of clerical quackery. The jettisoning of the details of the branches of internal maxillary artery, or of the phenomena associated with the reflection of light, will not strike at the roots of the scientific integrity of the profession.

To imagine that the reform of veterinary education can be brought about by the closer integration of the teaching of the disciplines as they now stand is to have failed utterly to grasp the fundamental crux of the whole problem. It is the disciplines as they now stand, in their overgrown condition and with their technical college bias, that are themselves the obstacles to the introduction of the university approach. In that it diverts attention from the real evil—the condition of the disciplines themselves—any consideration of closer integration as a solution to the problem can only retard the advent of eventual reform.

The ruthless cutting out of dead wood, the throwing overboard of everything not of patent value and the trimming back of the existing disciplines to make room in the curriculum for subjects which are of paramount importance but which are still untaught is the only way to convert the present veterinary course into a proper university education.

Of the subjects for which room must be made, first and foremost is economics. The student must be given a firm grasp of the economics of British agriculture, its whole relationship with international trade, finance and politics. He must be given an understanding of the meaning of subsidies both British and foreign, their purpose and the causes which brought them into being. He must be told about trade unions, agricultural wages, farming budgets and the mechanisation of agriculture. Not only would such a course of instruction immeasurably broaden a student's outlook and make him a man to be looked up to in a rural community, but it would bring a blast of cold fresh air into the cloistered atmosphere of the laboratory. As the result of such instruction the student would become conscious of the fact that in the veterinary world, as in nowhere else, everything hangs upon a balanced national economy and wise policy, and that a depression or an act of folly could well bring the profession down overnight like a house of cards and make the embryology of the pig as of much importance as the embryology of the Dodo.

Secondly, a place must be made for instruction in the history of animal husbandry and agriculture right the way up from the primitive nomad beginnings to the enclosure of land, the Industrial Revolution, and the advent of the internal combustion engine. The student must be given an insight into the agricultural policies adopted by successive British governments and the booms and slumps occasioned thereby, and must understand in broad outline the policies adopted by the governments of our major competitors in the agricultural sphere abroad.

Finally, he should be taught the history of domestic animals, the effect of domestication on both the animal and its owner, and the influence of the domestication of animals on mankind. He requires to be given an account of the horse and dog racing industries, their organisation and the amount of capital involved; he must be well grounded in everything associated with the keeping of pets and with

the vast industries which have become geared to that pastime. He must be given a very clear picture of the nature, objectives and ramifications of those companies which manufacture pet foods, and of those chemical combines and drug houses which are deeply committed financially to the production of drugs and vaccines used in veterinary practice.

The ultimate effect of such an education would be that when he finally left his college the veterinary surgeon would not only be a competent practitioner but an adult and educated man. He would have had his interest stimulated in very many ways, he would be in a position to see himself and his profession in their proper historical and economic perspective, and he would be able to play that leading part in the life of the community for which his university education intended him.

Yours faithfully,

Royal Veterinary College, RENE MERLEN.
Royal College Street,
June 10th, 1961.

Promazine Hydrochloride as a Tranquilliser for Sows

Sir,—Contrary to D. V. Sinclair's experience as noted in THE VETERINARY RECORD of June 3rd, I have had disappointing results with promazine hydrochloride in the treatment of gilts which savage their litters. A method which I find more satisfactory is the following:—

Pentobarbitone sodium B.Vet.C.* in a dosage of approximately 1/15th gr. per lb. bodyweight is given by slow intravenous injection to produce light anaesthesia as evinced by muscular relaxation, loss of hind pedal reflex and closing of the eyelids. At this level of anaesthesia reflex grunting may still be produced by rubbing the udder. The litter is put beside the gilt and no further interference is necessary.

If left undisturbed the gilt remains recumbent for 3 to 6 hours during which time the litter suckles apparently normally. She rises only after recovery from the anaesthetic is complete and only once in 6 consecutive cases which I have treated in this way has the gilt recommenced to savage her litter.

The main advantages which I see in this method over the use of promazine hydrochloride are that the effect is more certainly predictable and the gilt is temporarily immobilised thus removing the risk of her laying or treading on her piglets whilst under the influence of the drug.

Yours faithfully,
J. A. MARTIN.

Newmachar,
Aberdeenshire.
June 9th, 1961.

* Sagatal.

Administering Medicines to Small Birds

Sir,—While it is true, as is stated by Mr. Selwood in your issue of May 13th, that the medication of seed kernels is not in itself new, the novelty of the product† discussed in his letter lies not only in the method of impregnating the drug into the kernel without removing the husk, but in its overall acceptability to the bird.

We fully agree that seed de-husking birds such as budgerigars may sometimes accept de-husked seeds in small quantities, especially when these are mixed with whole seeds of the type normally eaten by the bird. It is, however, less natural for them to do so and one cannot always be sure that they will consume all, or in fact any, of the medicated seeds in the mixture and therefore obtain the benefit desired from the precise amount of the drug or adjuvant.

This is naturally most critical if one is prescribing modern drugs having a high potency and relatively small dosage; it is less important, of course, if non-specific adjuvants are being administered whose dosage rates may be arguable and the requirements for which may be less accurately known and thus somewhat empirical.

The only certain means of ascertaining that the correct amount of medicated seed has been taken is for these to be given unmixed with other food. Further, birds which are ill may eat very little, and it is essential that what they *do* eat is accurately medicated seed. Hence, for the first time it has become possible to prescribe specific drugs, including antibiotics, satisfactorily by the oral route.

Yours faithfully,
J. JACOBSON,
Medical Adviser.

Laboratories for Applied Biology Ltd.,
91, Amhurst Park,
London, N.16.
June 9th, 1961.

† Ornimed.

Caesarean Section in a Donkey

Sir,—On Easter Monday we were called to examine an 8-year-old donkey, pregnant for the first time. The donkey was said to be overdue and had shown milk for a fortnight; straining had commenced early in the morning, without delivery.

Our examination revealed a thickened unruptured foetal membrane protruding through an oedematous vulva and containing an over-sized foetal poll. The offspring was dead. Reduction was not possible and delivery by caesarean section was performed. Anaesthesia was induced by pentobarbitone sodium, and entry into the abdominal cavity by mid-line incision. Delivery and membrane separation were easy, but suturing of the peritoneum was difficult owing to its fragility and the ¾-inch thickness of sub-peritoneal fat. Megimide* was used to lighten anaesthesia and the donkey was left in the sitting position.

Antibiotic coverage was given for 4 days, and the animal made a slow but complete recovery.

Yours faithfully,
W. B. FAULL,
E. P. NELSON.

81a, Wantage Road,
Wallingford,
Berks.
June 7th, 1961.

* C. J. Hewlett & Son Ltd.